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THE
PHILOSOPHY OF MEDICINE:
OR,
MEDICAL EXTRACTS
ON THE
NATURE OF HEALTH AND DISEASE,
INCLUDING THE
LAWS OF THE ANIMAL ŒCONOMY,
AND THE
DOCTRINES OF PNEUMATIC MEDICINE.

BY
A FRIEND TO IMPROVEMENTS.

> There are three things which almost every person gives himself credit for understanding, whether he has taken any pains to make himself master of them or not.—These are: 1. *The art of mending a dull fire;* 2. *Politics;* and, 3. PHYSIC.
>
> DR. BEDDOES.

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OUR
RELATIONSHIP
TO
LIGHT.

SECTION I.

ON LIGHT.

LIGHT, like air and water, is known to be not a ſimple, but a *compound* body. The all-penetrating genius of Sir Iſaac Newton* has demonſtrated, by undeniable experiments, that *a ſingle ray of light*, which former philoſophers imagined ſo infinitely fine, is in reality a collection of *ſeven parts*, which are perfectly diſtinct, and compoſed of as many different colours, and ſubject to different reflections and refractions.

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* It appears to me, ſays Lord *Bolingbroke*, that THE AUTHOR OF NATURE has thought fit to mingle, from time to time, among the ſocieties of men, a few, and but a few of thoſe, on whom he is graciouſly pleaſed to beſtow a larger proportion of *the ethereal ſpirit* than is given in the ordinary courſe of his providence to the ſons of men. Look about you from the palace to the cottage; you will find that the bulk of mankind is made to breathe the air of this atmoſphere, to roam about this globe, and to conſume, like the courtiers of ALCINOUS, the fruits of the earth. *Nos numerus ſumus & fruges conſumere nati.* When they have trod this inſipid round a certain number of years, and begot others to do the ſame after them, they have lived: and if they have performed, in ſome tolerable degree, the ordinary moral duties of life, they have done all they were born to do. Look about you again, nay look, perhaps, into your own breaſt, and you will find that there are *ſuperior ſpirits*, men who ſhew, even from their early youth, though it be not

Some modern philoſophers have conſidered *heat* and *light* as one and the ſame ſubſtance. Although, it muſt be confeſſed, they are frequently found exiſting together, yet, on the other hand, muſt it be allowed, that there is often *much dazzling ſplendour* where there is *little* or *no heat*. The Honourable Mr. Boyle draws a minute compariſon between the light of combuſtible bodies, and that of ſhining wood, &c. Among other things he obſerves, that extreme cold *extinguiſhed* the light of ſhining wood, as appeared when a piece of it was put into a glaſs tube, and held in a freezing mixture. He alſo found that rotten wood did not *waſte* itſelf by ſhining, and upon the application of a thermometer he could not diſcover the ſmalleſt degree of *heat*.

That theſe are diſtinct ſubſtances, may be alſo proved from their diſtinct operations on the *living fibre*.

The muſcular fibres of the retina are excited into inſtantaneous action by the ſmalleſt variation in *light*: but are inſenſible to the greateſt changes in the circumambient *heat*. Moſt of the diſcous flowers, obe-

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always perceived by others, perhaps not always felt by themſelves, that they were called into this world for ſomething more and better. Theſe are they, who engroſs almoſt the whole reaſon of the ſpecies, who are born to *inſtruct*, who are deſigned to be the *tutors* and *guardians* of human kind. When they prove ſuch, they exhibit to us examples worthy of the higheſt praiſe, and they deſerve to have their names recorded, inſtead of a crowd of warriors, with whoſe feats the page of hiſtory is crowned and diſgraced.

dient to the impulſe of *light*, follow the ſun in his courſe. They attend him in his evening retreat, and meet his riſing luſtre in the morning. If a plant be ſhut up in a dark room, and a ſmall hole be made in the ſhutter, through which the *light* may penetrate, you would ſee the different plants confined there, turn towards that hole, and even alter their ſhape to creep through it, ſo that though theſe were *ſtraight* before, they would in a ſhort time become *crooked*, to obtain the full enjoyment of *light*. Thus if a GERANIUM be placed in any window for a certain time, the interior ſurface of every leaf would be turned to meet the *light*; and if you remove it to an oppoſite window, you would ſoon ſee a ſad contortion and confuſion among the leaves, until they had obtained a right poſition with regard to *light*. To prove that it is not *heat*, but *light*, which plants covet, if this GERANIUM be placed near a fire, which gives a ſtronger heat than the ſun, you would ſoon obſerve it turn away its leaves and flowers from the *fire* to the *ſun*.

To illuſtrate this curious circumſtance, Dr. Hill placed a plant of *abrus* in a room, where it had moderate day-light, without the ſun ſhining upon it. The lobes of the leaves were then fallen perpendicularly from the middle rib, and cloſed together by their under ſides. Thus they continued all night. *Half an hour after* day-break, they began to ſeparate, and *a quarter of an hour after* ſun-riſe, were perfectly expanded. *Long before* ſun-ſet they began to droop again, and towards evening were cloſed as at firſt.

Next day the plant was placed where there was *leſs* light. The lobes were raiſed in the morning, but *not ſo much*: and they drooped *earlier* at evening.

The third day it was ſet in a ſouth window, open to the *full ſun.*—*Early* in the morning the leaves had attained their horizontal ſituation: by *nine* o'clock they were raiſed above it, and continued ſo till *late* in the evening; then they fell to the horizontal ſituation, and thence gradually to the uſual ſtate of reſt.

Theſe experiments prove that the whole change is occaſioned by *light* only. To put this beyond diſpute, in the evening of the ſixth day, the plant was ſet in a book-caſe, on which the morning ſun ſhone, the doors ſtanding open. The day was bright. The lobes, which had cloſed in the evening, began to open *early* in the morning, and by *nine* o'clock they were raiſed in the uſual manner. I then, ſays he, *ſhut* the doors of the book-caſe: on opening them an hour after, *the lobes were all cloſed* as at midnight. On opening the door they expanded again, and in twenty minutes they were fully expanded. This has ſince been many times repeated, and always with the ſame ſucceſs. We can therefore, by admitting or excluding the light, make the plant put on all its changes. Hence we are certain, that what is called *the ſleep of plants*, is cauſed by the abſence of *light* alone, and that their various intermediate ſtates are owing to its different degrees.

Some experiments on plants give us reaſon to believe, that *light* combines with certain parts of vegetables, and that the green of their leaves, and the various colours of their flowers, is chiefly owing to this combination. This much is certain, that plants which grow in darkneſs are perfectly white, languid, and unhealthy, and that to make them recover vigour, and to acquire their natural colour, the direct influence of *light* is abſolutely neceſſary.

It would be difficult, in the preſent ſtate of chemical knowledge, to ſhew the combination of light with *our* bodies. But it cannot but be allowed, that *light* is a ſtimulus, awaking us to muſcular action, and opening an inlet to the ſtimulus of the various paſſions.

A thick and impenetrable cloud of *darkneſs* on a ſudden enveloped the Grecian army, and *ſuſpended* the battle. AJAX, perplexed what courſe to take, prays thus,

> Accept a warrior's pray'r, eternal Jove;
> This cloud of darkneſs from the Greeks remove;
> Give us but *light*, and let us ſee our foes,
> We'll bravely fall, tho' *Jove himſelf* oppoſe.

The ſentiments of AJAX are here pathetically expreſſed: it is AJAX himſelf. He begs not for life: a requeſt like that would be beneath a hero. But becauſe in *that darkneſs* he could diſplay his valour in no illuſtrious exploit, and his great heart was unable to brook a ſluggiſh inactivity in the field of action, he only prays for *light*, not doubting to crown his fall with ſome notable performance, though *Jove himſelf* ſhould oppoſe his efforts.

The boy, who was couched for blindneſs by Mr. Cheſelden, had no great expectation of pleaſure from a *new ſenſe*; he was only excited by the hopes of being able to read and write; he ſaid, for inſtance, that he could have no greater pleaſure in walking in the garden with his ſight, than he had without it, for he walked there at his eaſe, and was acquainted with every turn. He remarked alſo, with great juſtice, that his former blindneſs gave him one advantage over the reſt of mankind, which was that of being able to walk in the night, with confidence and ſecurity. But, when he began to make uſe of this new ſenſe, he ſeemed tranſported beyond meaſure. The brightneſs of the day, the azure vault of heaven, the verdure of the earth, the cryſtal of the waters, all employed him at once, and animated and filled him with inexpreſſible delight. He turned his eyes towards the ſun. Its ſplendour dazzled and overpowered him: he ſhut them once more; and, to his great concern, he ſuppoſed that, during this ſhort interval of *darkneſs*, he was returning to nothing. New ideas now began to ariſe; new paſſions, as yet unperceived, with fears, and pleaſures, all took poſſeſſion of his mind, and prompted his curioſity: love ſerved to complete his happineſs; and every ſenſe was gratified in all its variety.

I had not, perhaps, been thus diffuſe on the article of *light*, unleſs I had obſerved, that all animals, when afflicted with illneſs, fly inſtinctively to ſome *ſilent* and *dark* retreat, where, unaided by art, they quickly recover; and that man, left to the guidance of reaſon only, often falls ſhort in this reſpect of the brute creation, and frequently his powers, already weakened by diſeaſe, get ſtill the more *exhauſted* by an imprudent admiſſion of *company* and *light*. Every one, who has experienced a nervous fever, ſays the benevolent Mr. Townſend, muſt have felt the diſtreſs that is occaſioned by both *theſe ſtimuli* at the firſt onſet of this diſeaſe.

OUR
RELATIONSHIP
TO
HEAT.

SECTION II.

ON ANIMAL HEAT AS DEPENDANT UPON VITAL AIR.

It was ſhewn in the firſt volume, that when the heart did not receive blood impregnated with *oxygen air* it ceaſed to beat; beſides *the circulation of the blood*, we are indebted alſo for our *vital heat*, *to the oxygen air contained within the blood.*

The ingenious Dr. Crawford appears to have been the firſt who attempted to aſcertain by direct experiments the cauſe of ANIMAL HEAT as dependant upon the air. In an elaborate work he maintains, that the blood, which is returned to the lungs, is highly charged with *phlogiſton*,—that the air having a greater affinity for *phlogiſton* than the blood, attracts to itſelf *that principle*, and having in conſequence a leſs *capacity* for heat than before, it parts with a portion of its heat,—and as the *capacity** of the blood for heat is at the ſame time increaſed by the ſeparation of the *phlogiſton*, the *heat*, detached from the air, is fixed in a quieſcent or latent ſtate in the blood:— and that the blood in the courſe of the circulations abſorbing *phlogiſton*, and thereby having its *capacity* for *heat* diminiſhed, part of it (in proportion to the quantity of *phlogiſton* abſorbed) breaks out in the form of ſenſible or moving heat, and hence the cauſe of ANIMAL HEAT.

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* The meaning of this word may be eaſily underſtood, if we contemplate the CAPACITY of a *ſpunge* for containing water, and that of any other body; it muſt appear that bulk for bulk, its CAPACITY with regard to that fluid, is greater than the CAPACITY of any other known ſubſtance. Or, to give another illuſtration, *hot water* will diſſolve a greater quantity of *ſalt* than *cold*, and *hot air* will ſuſpend a greater quantity of *moiſture* than *cold air*. Hence *when theſe are changed into each other*, that is, the *hot water* containing ſalts is *converted* into *cold water*, and the

It required a ſtrong philoſophic conviction in Dr. Thornton to depart from a propoſition at that time ſo generally received. But having made many experiments,

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the *hot air* of the day into the *cold air* of the evening: in the firſt inſtance, the *ſuperabundant ſalt* before held in ſolution will be depoſited at the bottom; and in the ſecond, the moiſture, or the *dew* of evening, will deſcend on the ground. In the ſame manner the CAPACITY for *heat* being found greater in *arterial* than *venous blood*; hence when the *arterial* becomes *venous blood* (juſt as the *hot air* converted into *cold air* depoſited its *moiſture*, and *hot water* converted into *cold* depoſited *its ſalts)*, ſo muſt *arterial* blood converted into *venous* depoſit its ſuperabundant *heat*.

Dr. Crawford's opinion therefore, to ſtate it in a few words, is, that, in *reſpiration*, the blood is *diſcharging* PHLOGISTON and *abſorbing* HEAT; and that *in the courſe of the circulation*, it is continually *imbibing* PHLOGISTON and *emitting* HEAT. This excellent philoſopher became, however, a convert to the *new* or *antiphlogiſtic chemiſtry*, and being a patient to Dr. Thornton for the inhalation of air in a pulmonary complaint, he declared to that phyſician he was ſatisfied at the juſtneſs of his arguments adduced at Cambridge reſpecting the cauſe of *animal heat* as depending upon the decompoſition in the body of VITAL AIR.

periments, when enquiring into this ſubject, he was confident, that the OXYGEN AIR which WAS ABSORBED BY THE BLOOD (as is proved in Sect. VI.), was the true ſource of ANIMAL HEAT. Struck with the mportant diſcovery, he propoſed it as the ſubject of his *theſis* at Cambridge. The profeſſor of phyſic at firſt refuſed it, as being an opinion perfectly *novel.* He, however, at length very politely conſented to his diſputation on this queſtion, and Dr. Thornton maintained at Cambridge, previous to his receiving his degree in phyſic in that univerſity, in oppoſition to the opinion of Dr. Crawford, "that the *venal* blood "in the lungs abſorbs from the air not *fire*, but *oxy*-"*gen*, in combination with *the matter of heat* (OXY-"GEN AIR), and that in the circuit of the blood "through the body, the *oxygen*, meeting with ſome "ſuperior attraction, is divorced from its *caloric**, "which becoming diſengaged *(juſt as an acid diſ-"covers its ſenſible properties, its alkaline baſis being "withdrawn from it)*, ſo did it aſſume its well known "*active* character; and as *uncombined fire* ever tends "to form an equilibrium, or equal temperature "with the ſubſtances around, by pervading the bo-"dy, it became the ſource of VITAL OF ANIMAL "HEAT."

Animal heat, therefore, appears to be a *gentle combuſtion*:—and *an animal* in many reſpects may be compared to a *burning lamp*; the HEAT produced in both caſes ariſing from the *ſame cauſe.*

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* The matter of heat.

If AN ANIMAL be placed in *an exhauſted receiver* of an air-pump it quickly expires; in ſimilar circumſtances A BURNING LAMP goes out. If AN ANIMAL be not ſupplied with *freſh air* it dies, and its *heat* is extinguiſhed; ſo it is with the LAMP. The air breathed by ANIMALS is *diminiſhed in quantity*; ſo it is by the burning of THE LAMP. A *certain quantity* of air ſupports AN ANIMAL for a *certain time*, but no longer; ſo it will keep up the FLAME OF THE LAMP, for a *certain* time only. The air in which a LAMP has burnt out *deſtroys* ANIMAL *life*; ſo the air that THE ANIMAL hath breathed, *puts out* THE LAMP. Fixed, azotic, and inflammable airs, *deſtroy* ANIMALS; ſo likewiſe do they *extinguiſh* THE LAMP.

A LIVING ANIMAL and a BURNING LAMP, therefore, exactly agree in requiring the *ſame kind of air* to ſupport them, and in producing *the ſame effects* upon the air, to which they are expoſed.

But they do not reſemble each other only in *producing* HEAT, *and requiring the ſame kind* of AIR: for if AN ANIMAL hath not *freſh ſupplies* of FOOD, as well as AIR, after a *certain time* it dies, and becomes cold; juſt in the ſame manner as THE LAMP dies out, if not *duly ſupplied* with OIL.

Since then *that part* of the air deſtroyed by RESPIRATION is the *ſame* as *that* deſtroyed by COMBUSTION; and ſince the *ultimate effect* is the *ſame* in both operations, that is, THE PRODUCTION OF HEAT, is it not reaſonable to think, that the FOOD affords to the ANIMAL *principles alike attractive of* OXYGEN, *and diſengaging* HEAT, as the OIL affords to

THE LAMP? For ſince *the effects* are the ſame, *the cauſe* muſt be ſo too. OIL, therefore, *affords the principle attractive of* OXYGEN TO THE LAMP: and, conſequently, THE FOOD of animals *ſupports the generation of heat*, by *ſupplying to the animal body thoſe principles which are attractive of* OXYGEN, *the baſe of vital air*.

The *chemical analyſis* of ſuch ſubſtances as are to ſupport animal life confirms this opinion; for no ſubſtance affords proper nouriſhment, which contains not principles that readily combine with OXYGEN; and the inſtantaneous ſupport, and refreſhment, perceived by thoſe, who are much exhauſted, upon taking into the ſtomach certain inflammable ſubſtances, as diluted ſpirits, &c. depend upon the ſame principle. *Very different matters*, therefore, will ſupport ANIMAL LIFE, if they contain principles, ſeparable by the animal proceſs, that have an affinity with *oxygen*.

To prove that *animal heat* ariſes from the *decompoſition* of VITAL AIR by thoſe ſubſtances which attract *oxygen*, we have the following very ſtriking facts.

Mr. Windy having been previouſly indiſpoſed with ſtomach affection, had the extremities remarkably *cold*. He became at length inſane. He was placed in a mad-houſe at Chelſea; where for the firſt five months he raved, and after that, for four months, he ſcarcely ever uttered a ſingle word. When he was removed from this place to be under

Dr. Thornton, he was gloomy, ſullen, and ſilent, or muttered only expreſſions, which evinced what were the terrors of his diſturbed imagination. He had no recollection of his wife or children, and the only notice he took of his attendants, was to manifeſt ſuſpicion, that they meant to injure him. Dr. Thornton gave him for ſome days *oxygen air* mixed with atmoſpheric daily, but his hands continued ſtill as cold as clay. *Ether*, *brandy*, and *wine*, were tried, but without the leaſt effect in warming him when employed alone: but the primæ viæ being cleared, and *ether* and *brandy* being given, *before* the *inhalation* and *after*, a general *glow* was immediately produced, which extended even to his fingers ends. Nor was this a tranſitory effect, for the benefit after a while became permanent*.

Dr. Beddoes, the juſtly celebrated profeſſor of chemiſtry at Oxford, reſpired at times for ſeven weeks air of a much higher than the ordinary ſtandard, and commonly ſuch as contained almoſt equal parts of oxygen and azotic airs. He relates, in his letter to Dr. Darwin, "that he felt that "agreeable *glow*, and lightneſs of the cheſt, which "has been deſcribed by Dr. Prieſtley and others. "In no long time," he ſays, "I obſerved in myſelf "a remark-

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* For the ſequel of this caſe ſee Dr. Beddoes's Conſiderations, Part III. p. 109. It is thus with the culinary fire, ſometimes it will be ſufficient to *blow* it; added to this we muſt ſometimes employ *ſticks* alſo, and the fire being once *well kindled*, it will afterwards maintain itſelf.

“ a remarkable power of ſuſtaining *cold.* Except one “ or two evenings I never once experienced the ſenſation of *chillineſs*, though cold eaſterly winds pre- “ vailed, during great part of the time I inſpired “ the *ſuper-oxygenated air.* I was not only able,” he adds, “ to reduce my bed-clothes to a ſingle “ blanket and coverlid, but ſlept without inconvenience in a large bed-chamber, looking to the “ north-eaſt, with the window open all night, and “ with the door and windows of an adjacent ſitting “ room alſo open.—My appetite was keen, and I “ eat *one third* or *one fourth more than before*, without “ feeling the ſtomach loaded.”

Animal heat, therefore, proceeds from the chemical union of certain parts of our food and oxygen, modified, and combined, by the proper exerciſe of the natural animal functions, diſengaging caloric.

When we come to treat on digeſtion, it will be ſhewn how the *gaſtric juice* has a ſolvent power over *certain ſubſtances.* Our aliment is therefore broken down in the ſtomach into its conſtituent principles, and theſe comminuted parts then enter and paſs along the capillaries of the inteſtines, which are incapable of admitting any ſubſtance, unleſs in an highly attenuated or *aerial* form.

The anatomical lecturer at Piſa, in the year 1597, happening to hold a lighted candle near the ſubject he was diſſecting, on a ſudden the vapours that iſſued from the ſtomach and inteſtines were ſet on fire. In the ſame year Dr. Ruiſch was diſſecting a woman, and had no ſooner opened the ſtomach, than there iſſued out a yellow greeniſh flame, ſuppoſed to have ariſen from the vapours, which were kindled by a ſtudent's holding a lighted candle near him. Dr. Vulpare, the anatomical profeſſor at Bologna, affirms that any one may ſee, iſſuing from the ſtomach of an animal, a vapour that *burns like ſpirits of wine*, if the upper and lower orifices are bound faſt with a tight thread. The ſtomach thus tied up, muſt be cut immediately under the upper ligature, the contents of the ſtomach being firſt preſſed with both hands, ſo as to paſs to one ſide. A candle being held about half an inch from the aperture, a flame will be obſerved immediately to iſſue from the ſtomach. Bartholine relates the caſe of a perſon, who having drank much brandy for a wager, died, after an eruption of a flame of fire had firſt iſſued from his mouth. *The inflammable woman of Coventry*, as deſcribed by Mr. Wilmer, appears alſo to have reduced herſelf by dram-drinking to ſuch a ſtate as to be capable of being ſet on fire, and burn like any very combuſtible matter; *ſo eager*, ſays the learned Dr. Beddoes, *were the principles of which ſhe was compoſed to combine with oxygen.* In like manner the counteſs *Cornelia Bandi*, near Ceſena in Romagna, in 1731, in the ſixty-ſecond year of her age, was found in the middle of her bed-chamber reduced to aſhes. Theſe aſhes were light, and left in the hand a greaſy and ſticking moiſture. The floor was ſmeared with a groſs unpleaſant moiſture, and the walls and furniture were covered with a moiſt ſoot.

An inſtance of the ſame kind occurred at Chriſt-Church in Hampſhire, June 26, 1613; one John Hitchell, a carpenter of that pariſh, a great drunkard, having ended his day's work, came home and went to bed. His wife found him dead before morning at her ſide. He felt ſo extremely hot, that it was impoſſible to touch him. *He lay burning for three days*; nor was there any appearance of flame outwardly, but only a ſmoke or miſt aſcending from his carcaſe till it was conſumed.

Theſe curious inſtances of *quick combuſtion* carried on in the body, if I may be allowed to continue the expreſſion, are adduced only as exceptions to Dr. Thornton's general rule, "that within the body "there is always carried on a *gentle combuſtion*, pro"ductive of *the vital flame*."

SECT. III.

HOW LIFE DEPENDS UPON A DUE QUANTITY OF ANIMAL HEAT.

In the laſt Section it was proved, that *vital heat aroſe from the decompoſition of oxygen air in the blood.* In this it will appear, *how life depends on a certain degree of heat in the body.*

In the chick contained within an egg there are no powers capable of generating heat. Therefore until the chick receives heat from the mother it remains in a torpid and inactive ſtate. The principles of life are then called into action. A gradual extenſion of the parts commence. During the time of incubation, the living principle every day increaſes in quantity and power with the perfection of the animal, and the capacity of its organs for performing its functions, and *generating heat,* which laſt does not happen till the time of its excluſion from the ſhell: after which, the chick does not depend *entirely* on the mother for the production of that heat, which muſt always accompany and ſupport the functions of life. When, by reſpiration, the firſt action after birth, *oxygen air* is abſorbed by the blood, the motion of the heart, the circulation, and other operations, are carried on with greater vigour than formerly, and the food being ſeparated into principles attractive of *oxygen*, the chick is capable, in a great meaſure, of generating a degree of heat equal to that of the parent. At firſt the mother, by a wonderful inſtinct, as if conſcious of the tender ſtate of her offspring, and of the impoſſibility of their being kept ſufficiently warm by their own powers, gathers them under her wings to cheriſh that vital warmth, which ſhe appears to judge them incapable of creating, and *without which* they would neceſſarily periſh. In the ſame way, if, during incubation, the hen leaves her neſt ſo long as to cool the eggs a few degrees, from that period the powers of life are proportionably diminiſhed, and a ſtop is put to the growth of the chick; both of which, if the eggs have not been cooled too far, are recoverable on the return of the hen, or of that genial heat they receive from her body. The mother is ſo ſolicitous to preſerve *this heat*, that ſhe ſeldom leaves her neſt above five or ſix minutes in the day, to take a ſlender repaſt; and when ſhe diſcovers the motion of the chickens in the eggs, ſhe then ſits ſo cloſe, that even the ſight of food, though ever ſo much preſſed by hunger, can ſcarcely prevail with her to ſtir from the eggs for three or four days, or until they are completely hatched. But if ſhe abandons her neſt altogether, or is killed by accident, then, as the eggs cool, the powers of life gradually decline, till they are at laſt totally aboliſhed by the death of the chickens.

Though *the functions of life*, in this inſtance, are ſoon deſtroyed or ſuſpended for want of a due quantity of animal heat, yet in ſome creatures, under theſe circumſtances, the *vital principle* ſtill remains intire. Thus flies, when the cold comes in, appear as if deprived of ſenſe, and in proportion to the degree of cold, the *moving mechaniſm* is *retarded.* But if the weather be *intenſely cold, they then "ſleep the "ſleep of death."* Hence the reaſon why we ſee toads burrowing, frogs living under large ſtones, ſnails ſeeking ſhelter in the hollows of trees, and fiſhes having recourſe to deep waters; the heat of all theſe places being generally *above* the freezing point, even in our froſts, which are however ſometimes ſo ſevere, as to kill many whoſe habitations are not well choſen.

Some years ago I cut out, ſays Dr. Gardinor, the heart and part of the large veſſels of a turtle, with a view to examine the ſtructure of theſe parts and the circulation of the blood in that animal. Having wiped off the blood and other moiſture, the heart was wrapped up in a handkerchief; but engagements in the way of my profeſſion obliged me to poſtpone my curioſity till about ſix or ſeven hours after it was cut out. When I examined it, there appeared not the *leaſt ſigns* of life. It was much ſhrivelled and dried. But, by putting it into water, nearly *milk warm*, it plumped up, and ſome of its parts acquired a tremulous motion. Laying it on the table, and pricking it with a large needle, it palpitated ſeveral times. The palpitations were renewed, as often as the needle was puſhed into its ſubſtance, until it became *cold*, when it ſeemed to be inſenſible to every ſtimulus. But, after *warming* it again in the water, it recovered its *irritability*, and repeated its palpitations on the application of the needle. Though no movement could be excited in it by any ſtimulus when *cold*, yet it moved ſeveral times after being macerated in *warm water*. *This evidently ſhews the neceſſity of* HEAT *for maintaining the full powers of the contractile living principle.*

The effects of temperature is, in a moſt ſatisfactory manner, illuſtrated by the learned and ingenious Dr. Robertſon, in his hiſtory of *America*; when taking a view of the effects of climate on the human body, he ſays, In every part of the earth where man exiſts, the power of climate operates with *deciſive influence* upon his condition and character. In thoſe countries which approach near to the *extremes* of *heat* or *cold*, this influence is ſo conſpicuous as to ſtrike every eye. Whether we conſider man merely as an animal, or as a being endowed with rational powers, which fit him for activity and ſpeculation, we ſhall find that he has uniformly attained the greateſt perfection, of which his nature is capable, in the *temperate regions* of the globe. There his conſtitution is moſt vigorous, his organs moſt acute, and his form moſt beautiful. There, too, he poſſeſſes a ſuperior extent of capacity, greater fertility of imagination, more enterpriſing courage; and a ſenſibility of heart, which gives birth to paſſions not only *ardent* but *perſevering*. In this favourite ſituation he has diſplayed the utmoſt effects of his genius, in literature, in policy, in commerce, war, and in all the arts which improve and embelliſh life.

He accordingly divides the natives of America into *two diſtinct claſſes*; the *one* inhabits the *temperate*, the *other* the *torrid zones*, on both ſide of *the line*. He ſays, that the human ſpecies in the *former* appears manifeſtly more perfect: that the natives are more robuſt, more intelligent, more active, and more courageous. They poſſeſs, in the moſt eminent degree, that force of mind, and love of independence, which are regarded as the chief virtues of man in his ſavage ſtate. Theſe natives accordingly, though ſurrounded for ſeveral centuries paſt by poliſhed and hoſtile nations, have hitherto maintained, in a great degree, their freedom and independence: but the *other* claſs, from the debility of their mind and body, their inactivity, want of active courage, and of that independence which characteriſes thoſe living in the more *temperate climates*, have become ſo dependent as to be nearly in a ſtate of ſlavery to thoſe nations, who, for the ſake of mines or commerce, have taken poſſeſſion of their territories.

SECT. IV.

HOW NATURE INCREASES OR RIDS HERSELF OF THE ANIMAL HEAT.

IN the laſt Section *the cloſe connexion between life and heat* was ſhewn; we ſhall ſlightly conſider here *the method Nature takes to increaſe or rid herſelf of this ſubtile and penetrating fluid.*

ANIMAL HEAT USUALLY EXCEEDS THE SURROUNDING AIR*.

As the heat of the living body generally *exceeds* that of the ſurrounding atmoſphere, it is obvious, ſo far from any heat being derived from it, on the contrary, the body muſt *communicate* heat to the external air; and if we conſider the great difference ſubſiſting between the temperature of the human body, and that of the atmoſphere in our climate, it is clear that a very large portion of heat muſt be ever *eſcaping* from the body, and of courſe there muſt be *conſtant generation* of animal heat carried on in the body to balance this conſumption.

Every one who has paid attention to the temperature of the atmoſphere by means of the thermometer,

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* A thermometer being put under the tongue of man in all countries *riſes* to 97. HUNTER *on the Animal Economy.*

meter, muſt have obſerved how frequently our feelings, reſpecting heat and cold, *diſagree* with the indications of them, as expreſſed by that inſtrument; ſince it often happens, that when experiencing a very conſiderable degree of cold, we are ſurpriſed to find the mercury at a moderate temperature; and this may be obſerved uſually to happen in *windy weather*, or when the air is particularly loaded with *wet particles*.

This can be accounted for on no other principle than that of *the conſtant production of heat within the animal, and of its tendency to paſs off by the ſurface*: for the thermometer very ſoon acquiring the temperature of the air, becomes at once ſtationary, varying only with the real changes which take place in the atmoſphere; whereas the conſtant ſucceſſion of heat, which there is in the living animal, prevents it acquiring the temperature of the air, and it cannot, therefore, like the mercury, deſcend to its temperature, and then become ſtationary; and as the ſenſe of cold felt by us, muſt conſequently be owing to the conſtant *eſcape* of heat which is thus promoted, the degree of cold felt muſt obviouſly be in proportion to the celerity with which the air is enabled to *carry off* the warm atmoſphere ſurrounding us.

The effects produced by *fanning*, when perſons are very hot, may be underſtood from the principles of the foregoing doctrine: when the ſurface is loaded with heat, and the air, which is in immediate contact with it, has already taken up ſo much, that it is either unable to carry off any more, or performs this office ſo ſlowly, as to be unequal to the removal of the quantity which is conſtantly arriving at the ſurface, the driving away ſuch air by the fan, and permitting other colder air to approach, which not being ſo loaded, is able to carry off the heat more quickly, the ſkin muſt in conſequence feel cooled.

Moiſt air is, likewiſe, a better conductor of heat than when dry, becauſe *water*, though of the ſame temperature with air, is well known to carry it off more quickly than air will do.

If, therefore, *theſe two cauſes unite*, as is the caſe in *moiſt* and *windy* weather, we may eaſily underſtand why the heat from animals ſhould be carried off more quickly, and the animals ſhould experience a greater ſenſe of cold, than when the air is *ſtill* and *dry*, though the thermometer ſhould, in both caſes, ſtand at the ſame point.

Even in torpid animals the temperature of heat is conſtantly *higher* than the ſurrounding medium.

In the *winter*, the atmoſphere at forty-four degrees, the heat of the torpid hedge-hog at the diaphragm was found, by Mr. Jenner, to be 48°$\frac{1}{2}$.

When the atmoſphere was at twenty-ſix degrees, the heat of a torpid hedge-hog was reduced ſo low as 30°.

In *ſummer*, the atmoſphere at ſeventy-eight degrees, the heat of the hedge-hog at the diaphragm was found to be 97°.

The atmoſphere being at thirty, that ingenious and moſt accurate experimental philoſopher, Dr. Haighton, the preſent Lecturer on Phyſiology at Guy's Hoſpital, found the animal heat of a torpid bat at 33°; and when the atmoſphere was at ſixty, he found it ſo high as 63°; that is, during life the *vital heat* was always found, even in dormant animals, *to exceed the ſurrounding medium.*

OF THE RETENTION OF ANIMAL HEAT.

It may be remarked, that all animals, when the heat is paſſing off them in an *inconvenient degree*, endeavour to CHECK IT by leſſening the ſurface of their bodies, which is expoſed to the ſurrounding air; thus we ſee why dogs, cats, &c. when lying on the ground, and not in a warm ſituation, draw their limbs cloſe to them, and endeavour to acquire ſuch a poſture of the whole body, as ſhall bring all the parts as much into contact as poſſible; and when in a contrary ſituation, as expoſed to the warm rays of the ſun, or near the fire, they ſtretch out their limbs, and extend their whole ſurface as much as poſſible: and we all know, that we ourſelves, when naked, or when entering a cold bed, do exactly the ſame thing; and in bed we continue ſuch a poſture until ſuch a quantity of heat has been accumulated, and confined by the bed-clothes, as to remove all ſenſation of cold, when, like the before-mentioned animals, we ſtretch forth our limbs, and acquire our accuſtomed poſture.

The univerſal cuſtom of the inhabitants of all countries in which the temperature of the atmoſphere is below the ſtandard of the heat of the human body, making uſe of apparel, and this being thicker or thinner in proportion to the reſpective differences of ſeaſons or climates, is founded on the ſame principle, *to prevent ſuch an eſcape of heat from the body as would be unpleaſant or injurious.*

The ſame thing may be obſerved of the natural clothing of different animals; in *warm climates* their coats are ſhort, ſmooth, and lie cloſe to the ſkin; but in the *northern regions* their covering conſiſts of a rarer ſubſtance, as fur, wool, &c.

It may likewiſe be obſerved, that even in the *ſame animals* a difference, reſpecting the heat-conducting powers of their covering, takes place under different expoſures; that in *ſummer* it is leſs calculated to retain their heat than in *winter*; and when protected by the external cold, by living *within doors*, than when expoſed to it when living in the *open air*. The horſe may be conſidered as a very familiar inſtance of the truth of this remark, for every one knows how long and rough the coats of thoſe are which winter in the *ſtraw-yard*, and how ſhort and ſmooth are the coats of thoſe which are kept in warm *ſtables*; and that it is a common practice with ſuch as have the care of horſes, to cover them with woollen cloths, to render their coats fine and ſmooth.

In *birds* this provident care of nature is peculiarly ſtriking; as they paſs freely through the air, and are often expoſed in the higher regions to a very cold medium, their natural heat would paſs off much too quickly, if they were not covered with a ſubſtance which conducts heat very ſlowly, which feathers are well known to do: and in thoſe birds that *live in water*, which withdraws heat much quicker than air, their covering is much more rare and compact than common feathers; the down upon the breaſt and under the bellies of thoſe birds, which in cold climates live principally in the water, being perhaps the ſloweſt conductors of heat in nature; modern luxury having, on this principle, ſet a great value on the down of the *eider duck*, and its uſe in retaining heat, to which it is applied, being well known in fits of the gout; to which caſes, on account of its extraordinary lightneſs, it is particularly well adapted, as the parts affected are uſually ſo exquiſitely tender, as to ſuffer pain from the contact of whatever has weight, or occaſions preſſure. The ſlow conducting power of this down being evidently owing to its rare texture, it is obvious, that to retain this quality it ſhould remain perfectly dry, as the plumage, when *wet* *, will very ſoon collapſe together, and form a body capable of carrying heat off, perhaps, too quickly. To guard againſt this circumſtance, nature has kindly furniſhed *theſe aquatic birds* with a peculiar kind of OIL, and has given them the power of occaſionally opening the receptacle where it is depoſited, and of ſpreading a ſufficient quantity of it over their outermoſt feathers, by which the contact of water is effectually prevented.

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* Mr. Hunter, having put a *dormouſe* in a freezing mixture, could not freeze the whole animal, but only the feet, the

Laſtly, we may obſerve, that the *ſenſible perſpiration* is much leſs in cold than in hot weather, which circumſtance in the next paragraph will be more particularly conſidered.

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the hair being ſo bad a conductor of heat, that the *heat* withdrawn from the animal was not more than its powers were capable of generating. Taught by the failure of this experiment, I took care, ſays this great phyſiologiſt, that the hair ſhould not a ſecond time be an obſtruction to our ſucceſs. Having, therefore, firſt made the animal *wet all over,* that its heat might be more expeditiouſly carried off, it was put into a leaden veſſel, and the whole placed in the cold mixture as before. The animal ſoon gave ſigns of feeling the cold, by *coiling* itſelf into a round form, and repeatedly attempting to make its eſcape; and the breath and water evaporating from its body being ſoon frozen, appeared like a hoar froſt on the ſides of the veſſel, and on its whiſkers; but as long as the vigour of life laſted, it ſeemed to defy the cold. However, from the air being *wet,* and thereby rendered a good conductor, there was a much greater conſumption of heat than in the firſt experiment; which haſtened on a diminution of the power of producing it. The animal ſoon became ſtiff; and upon being thawed, was found quite dead. HUNTER *on the Animal Economy.*

THE ESCAPE OF ANIMAL HEAT.

When the air is of that particular temperature which, with the aſſiſtance of other operations in the œconomy, is juſt ſufficient to carry off ſuch a quantity of the heat generated in the body, that the remainder ſhall exactly ſupport the animal body, we ſay ſuch an air is mild, or it is temperate; becauſe we are not ſenſible of any troubleſome degree of heat or cold. This preciſe temperature varies in different people, according to the climate, age, and conſtitution of the individual; but at whatever point of the thermometer this temperature may be, if it riſes or falls a few degrees only, we then complain of heat or of cold, and employ various ways of obviating their effects. When we are ſurrounded with a *warm air*, a *free perſpiration* ſucceeds; and if a further accumulation of heat takes place in the body, a *ſweat* is brought on proportioned to the ſtimulus, from the exceſs of heat. Nature is now employed in COUNTERACTING *the effects of an accumulation of heat* by the refrigerating proceſs of *ſweating*, and the conſequent expenditure of heat in the formation of vapour. How ſoon will the mercury and the thermometer cool by the ball being wet with æther, or volatile alkali! The degree of cold that may be produced in this way, has been ſufficiently proved by the celebrated Dr. Cullen. Witneſs the ice found in the morning on linen hung out to dry during the night, when the temperature of the air is even much above the freezing point: the practice of cooling wine in warm countries, by hanging up their bottles in wet cloths to the ſun*, to expedite the evaporation; the cooling of the wine going on in proportion to the quickneſs with which its heat is abſtracted by the vapour. I ſhould not have inſiſted ſo much on the effects of *evp oration*, ſays Dr. Gardiner, Preſident of the Royal College of Phyſicians at Edinburgh, had I not conſidered it as a material circumſtance in examining the effects of hot air on the human body, which ſooner or later, according to the degree of heat it poſſeſſes, produces, in the manner above mentioned, a *ſweat*, and conſequently *evaporation* from every part of the body. Not that the whole of the matter perſpired is turned into vapour; it is only ſuch a portion of it as can readily abſorb the neceſſary quantity of heat from the body and external air, which will be in proportion to the degree of heat they poſſeſs; the reſt running in drops off the body, or it is abſorbed by the cloths, and is afterwards evaporated from them.

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* The Arabians have this remarkable method of cooling their wines when conducting caravans over the deſerts, which exhibits, in the moſt forcible manner, the truth of the above account. They dig a hole, and having filled it with ſtraw, they place the bottle of wine they mean to cool into the midſt of it, having previouſly ſurrounded it with *wet* ſtraw or clay. They then ſet fire to the ſtraw, and the bottle of wine is brought out (from the evaporation of the wet clay or ſtraw ſurrounding it) *quite cool.* Vide Philoſ. Tranſ. Vol. LXV. p. 252.

The matter of heat, or caloric, finds, moreover, other outlets to eſcape by, beſides the ſurface of the body; as a conſiderable quantity muſt, evidently, paſs off from the *lungs* in breathing. Indeed the quantity which is carried off by the air, as alſo by the lungs, is found, by experience, to be much greater than one would at firſt imagine, "*for we know that the heat contained in one breath of air, will, if properly managed, raiſe Fahrenheit's thermometer ten degrees*[*]." And provident nature ſeems to take advantage of this circumſtance, when an extraordinary quantity of heat is ſuddenly excited in thoſe animals, which are but little able to carry off a ſuperabundance: thus *dogs*, which do not ſweat, and *ſheep*, whoſe clothing is ſo particularly unfavourable to the carrying off an unuſual quantity of heat, always open their mouths very wide, that the whole ſurface of the fauces may be expoſed, and move the tongue remarkably quick, to agitate the air in contact with it.

When heat is accumulated in the ſyſtem, either by fever, by ſtrong exerciſe, or by the ſcorching heat of the ſun, nature conſtantly cries aloud for ACIDS, and a *cooling diet*; and to thoſe who have turned their mind to chemiſtry, the reaſon for this ſtrong deſire is obvious. They know that *animal heat* originates in the decompoſition of OXYGEN AIR, after it is received into the blood by the lungs; and they obſerve, that the quantity of air which is decompoſed or vitiated, bears direct proportion (as will be explained when mentioning the experience of the celebrated diver Mr. Spalding) to the quantity of combuſtible matter, whether animal or vegetable, whether ſugar, oil, or ſpirits, received into the ſtomach. They obſerve, likewiſe, that *acids* taken into the ſtomach always check, and reſtrain the generation of heat; or, in other words, that when the ſyſtem is ſaturated with OXYGEN only, leſs OXYGEN AIR (oxygen and *caloric*) is imbibed by the blood in the lungs, and conſequently leſs *heat* will be evolved in the body. It is upon theſe principles, ſays the Rev. Mr. Townſend, that the reapers in the ſouth of Spain covet their *guzpacho*, compoſed of bread, oil, and *vinegar:* the two firſt articles for nutriment, and the latter to moderate their vital heat. On the ſame principles, obedient to the voice of nature, during the ſultry heats of ſummer, we equally deſire our lettuce, oil, and *vinegar*, and we may remark, that in *warm climates*, and in ſummer in the *more temperate regions* of the globe, the *aceſcent* and watery fruits abound, but in the autumn *we* have chiefly thoſe which produce *oil* and *ſugar*, while dried *fiſh*, *meat*, and train *oil*, form the principal ſupport of the hardy inhabitants of the *north*.

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[*] Vide Critical Review for January 1782, page 6.

PRACTICAL OBSERVATIONS.

SECT. V.

I. OF THE CLOTHING OF INFANTS.

MIDWIFERY was firſt practiſed by women. Hence the dreſſing of children became an art which few could attain unto. Each midwife ſtrove to outdo all others in this pretended knowledge. Theſe attempts were ſeconded by the vanity of parents, who, too often deſirous of making a ſhow of the infant as ſoon as it was born, were ambitious to have as much *finery* heaped upon it as poſſible. Thus it came to be thought as neceſſary for a midwife to excel in bracing and dreſſing an infant, as for a ſurgeon to be expert in applying bandages to a broken limb; and the poor child, as ſoon as it came into the world, had as many rollers and wrappers applied to the throat* and body, as if every bone had been fractured in the birth; while theſe were often ſo tight, as not only to gall and wound its tender frame, but even to obſtruct the motion of the organs neceſſary for life.

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* As the *long ſtay* to hinder the child from bending back the head and breaking its neck!

Nature knows no other uſe of clothes but to keep the body *warm.* All that is neceſſary for this purpoſe, is, when the child is born, to excite the external circulation by rubbing it with brandy and water with the warm hand, and having affixed the *belly-band* made of *fleecy hoſiery*[*], to wrap it in a looſe covering of the ſame ſoft material; and then to lay it by the ſide of the fond mother to partake of *her* vital warmth[†]. Were parents left to the dictates of nature alone, they would certainly follow this method. If we conſider the body of an infant as a bundle of ſoft pipes, repleniſhed with fluids in continual motion, the danger of *preſſure*[‡] will appear in the ſtrongeſt light. Nature, in order to make way for the growth of children, has formed their bodies ſoft and flexible; and leſt they ſhould receive any injury from preſſure in the womb, has ſurrounded the fœtus every where with yielding fluids. This ſhews the care which nature takes to prevent all unequal preſſure on the bodies of infants, and to defend them againſt every thing that might in the leaſt cramp or confine their motions.

Not only the analogy of other animals, but the very feelings of infants, inform us, they ought to be kept eaſy and free from preſſure. They cannot indeed tell us their complaint; but they can ſhew ſigns of pain; and this they never fail to do, by crying when pinched by their clothes. No ſooner are they freed from their bracings, than they ſeem pleaſed and happy; yet, ſtrange infatuation! the moment they hold their peace, they are again committed to their chains. I have known, ſays the benevolent Dr. Buchan, numerous children ſeized with *convulſion-fits* ſoon after the midwife had done ſwaddling them, who, upon taking off the rollers and bandages, were immediately relieved, and never had that diſeaſe recur afterwards.

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[*] More will be ſaid hereafter of this happy diſcovery. At the ſame time that it is *warm* and *unirritating*, it is perfectly *elaſtic*.

[†] Vide Section III. *How life depends on a certain degree of heat in the body.*

[‡] Some allowance ought certainly to be made for the ſwelling of the muſcles during ſleep.

II. OF THE CLOTHING OF ADULTS.

We have before contemplated the benevolent care of PROVIDENCE to the lower order of creatures in providing them with *clothing ſuited to the climate and the ſeaſon of the year* *. The horſe, the deer, and birds, *double* their covering in the beginning of the cold ſeaſon, and *ſhed* it in the ſpring when a warm garment is no longer ſerviceable.—The beaver removed to the higher latitudes exchanges its fur, and the ſheep its wool, for a coarſe hair, *to al-*

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* When treating, Sect. II. *On Animal Heat*; alſo Sect. III. *How Life depends on a certain Degree of Heat in the Body*; and in Sect. IV. *On the Method Nature takes to increaſe or rid herſelf of this ſubtle and penetrating Fluid.*

low of the eſcape of heat. The coarſe and black ſhag of the bear, on the contrary, is converted in the arctic regions into the fineſt and whiteſt fur *to retain the vital flame.*—In ſhort, the ſoftneſs and denſity of hair in animals ſeems always in proportion to the coldneſs of the country. The Canadian and Ruſſian furs are therefore better than the furs of climates farther removed from the north. It is well known that the fur of the ermine is the moſt valuable of any hitherto diſcovered: and it is in winter only that this little animal has it of the proper colour and conſiſtence. NATURE has provided ſome animals with another reſource; when the ſeaſon becomes too cold for their conſtitutions, they ſleep, or emigrate into warmer climates.

Pliny, one of the moſt celebrated naturaliſts of antiquity, pathetically laments, "that whilſt NATURE has given various clothing to the brute "creation, and even fenced plants and trees with "bark, againſt the injuries of the cold and heat, "ſhe ſhould have caſt man into this world naked, "unprovided againſt the inclemency of different "climates and ſeaſons." But inſtead of agreeing with that philoſopher, that NATURE has, in this particular, acted more like a cruel ſtep-mother, than a kind and indulgent parent to man, we cannot ſufficiently extol her providence and wiſdom. It was no more than conſiſtent with equity to provide the irrational part of her works with clothing ſuitable to their circumſtances; but man, whom ſhe endued with the tranſcending faculty of *reaſon*, ſhe hath very wiſely left to accomodate himſelf to the difference of ſeaſons and of climate, and to clothe himſelf accordingly with the plumes, the fleeces, the ſkins of animals, and the products of various plants and trees. This would invariably be found to be the caſe, were not man, alas! ſervilely imitative, and in the higheſt degree capricious in the ornaments of his perſon. Hence it is, that the nations beyond the *Indus*, as well as the *Tartars*, are at great pains to compreſs their eyes at the corners, and to ſtretch their ears by heavy weights appended to them, and pulling them frequently with the fingers, ſo that they may hang down to their ſhoulders, which *they* conſider as the higheſt mark of beauty. On the ſame principle, they extirpate the hair from their bodies; and, on the face, they leave only a few tufts here and there. The *Tartars* frequently extirpate the whole hair of the head, except a knot on the crown, which they braid and adorn in different manners. Some, and among others the *Turks*, cut the hair off their heads, and let their beards grow. The *Europeans*, on the contrary, ſhave their beards, and wear their hair. Every nation ſeems to have entertained prejudices, at different times, in favour of one part or another of the beard. Kingſon aſſures us, that a conſiderable part of the religion of the *Tartars* conſiſts in the management of their whiſkers; and that they waged a long and bloody war with the *Perſians*, declaring them infidels, merely becauſe they would not give their whiſkers the *orthodox* cut. Peter the Great had nearly occaſioned a revolution in his kingdom, by wiſhing to have his ſubjects ſhaved. In our country we daily ſee men, who encourage the growth of the hair on the cheek, below the ear, to look fierce, while others again wiſh to have the ſize of their underſtanding meaſured by the ſize of their heads. The largeneſs of the doctor's wig* ariſes evidently from the ſame cauſe as the ſmallneſs of the beau's queue. In *Arabia* and *Greece* large eyes are eſteemed beautiful; and in theſe countries they take extraordinary pains to ſtretch the lids, and extend their aperture. Among ſome *Indian tribes* in *America* they flatten the forehead in infancy by the application of broad plates of lead, and file to a point all the teeth to imitate the canine. In *Africa* they flatten the noſe, to accompliſh *their* idea of beauty. The ſkin in many nations is darkened by art; and all ſavages eſteem certain kinds of deformity to be perfections; and ſtrive to heighten the admiration of their perſons, by augmenting the terror of their features. In *China*, the reigning faſhion is ſtill more contemptible; to appear *ever idle*, they ſuffer their finger nails to grow to an enormous length, and *pinch their feet* into the ſmalleſt ſize imaginable. The latter cuſtom has unfortunately reached theſe kingdoms. Inſtead of having the ſize and figure of the ſhoe adapted to the ſhape of the foot, the toes muſt be crampt, and deprived of all ſeparation, which the perſpiration of that part ſeems to demand*, and nine tenths of mankind are troubled with corns, a complaint that is ſeldom or never occaſioned but by narrow and pointed ſhoes. The ladies, who ever improve on the faſhions of the time, to gain a little in height, lengthen out the heel, and conſtantly walk on *tiptoe*. The conſequence of which is, acting contrary to the intentions of NATURE, they never ſeem to walk well; and as the fibres of the muſcles of the calf are not drawn into their due tenſion, they become ſubject to frequent and incurable *cramps*, which, as diſturbing ſleep, is again the remote cauſe of other dreadful diſorders.

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* The tye-wig was diſuſed in England through the humour of Dr. Somerville. Some of the faculty having taken offence, that he came not unfrequently to *George's* unarrayed with the ſword, and in coloured clothes, and being on that account one day openly inſulted by his indignant brethren, he came the next day to the coffee-houſe, having on the jehu of his coachman, who, on the contrary, had on the doctor's tye. "*Here,* "*gentlemen*, he ſaid, *is an argument to the purpoſe, that knowledge* "*does not conſiſt in exteriors. There are none of you, who would* "*truſt me to drive you, and the world ſhall ſoon ſee, alſo, as I paſs* "*through the ſtreets of London, that the wig does not conſtitute the* "*phyſician.*" Having made for ſeveral days this curious exhibition, the tye-wig was quickly converted into a ſubject of ridicule, and Dr. Somerville gained the day.

The ſhape GOD has given is too often attempted

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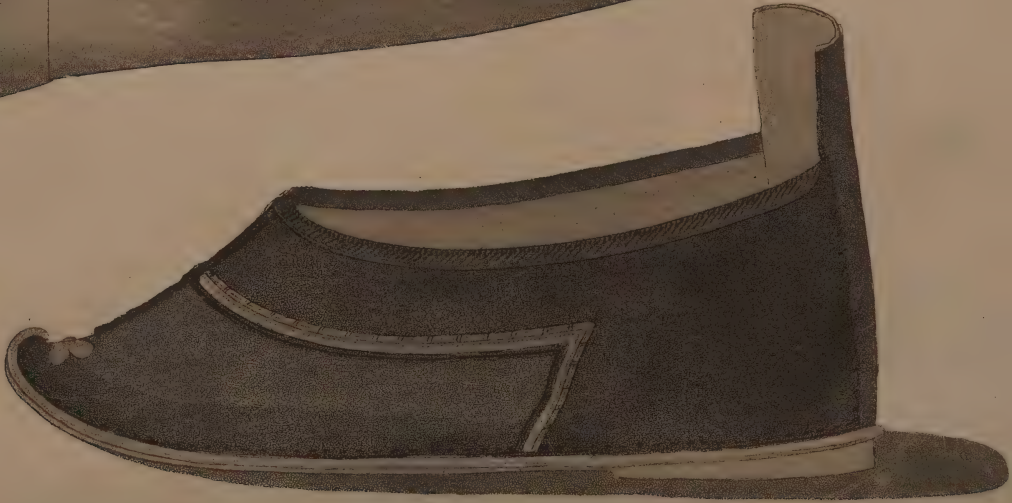
* Dr. Vaughan, of Rocheſter, recommends ſtockings to be made with the ſeparation like gloves.

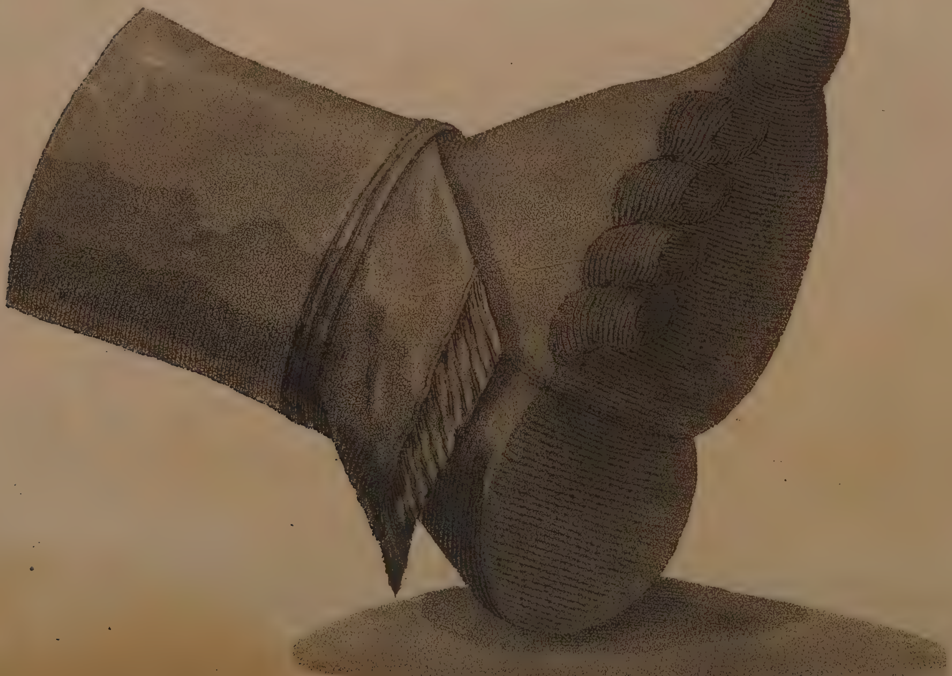
The Sole



A Chinese Shoe.

A Chinese Foot,

From a Model in the Poſseſsion of Mr. Cruikshank.



to be *mended* by dreſs, and thoſe who know no better, believe that mankind would be frights without its aſſiſtance. The bones of growing perſons are ſo cartilaginous, that they readily yield to the ſlighteſt preſſure, and eaſily aſſume the ſhape of the mould in which they are confined. Hence it is that ſo many girls in proportion to boys are miſhapen*. Deformity of body may indeed proceed from weakneſs or diſeaſe; but in general, ſays Dr. Buchan, it is the effect of improper clothing. The preſſure of the abdomen by ſtays impedes the action of the ſtomach and bowels, and the motion neceſſary for reſpiration, and conſequently the juſt circulation of the blood. Hence a train of dreadful diſorders enſue. The pliancy of the body, and the natural grace of the female form, is prevented by this rigid coat of mail. The imprudent zeal of the mother for a fine ſhape performs another moſt unkindly office to the child. She frequently becomes either incapacitated for marriage, or dies in child-birth. The madneſs in favour of ſtays ſeems,

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[*] A Lady in the city, who had no girls, though her family was numerous, but were *miſhapen*, conſulted the celebrated anatomiſt Mr. Cline, on the prevention. "*To have no ſtays—and to let the next girl run about like the boys*," was the excellent advice of this gentleman, which being complied with, neither ſhe nor any of the future children were afterwards *marred* by the ill-placed attention of the ignorant mother. This ſtory Mr. Cline is very careful to deliver in his public lectures at St. Thomas's Hoſpital twice a year.

however, to be ſomewhat abated; and it is hoped the world will, in time, become wiſe enough to know, that the human ſhape does not ſolely depend upon whalebone and bend-leather.

In *England* we ſeldom enjoy any continuance of ſettled weather, except towards the cloſe of ſummer, and the beginning of autumn, and even then we are frequently balked in our expectations. The ſudden changes that take place during three fourths of our year may be regarded as no leſs prejudicial to the health, than diſagreeable to our feelings; and our terrors of *catching cold*, which have frequently appeared ridiculous to foreigners, are really better founded than we ourſelves are apt, moſt of us, to apprehend; *colds* in their *conſequences* proving fatal to thouſands every year. Though we cannot hope entirely to eſcape the unpleaſant ſenſations, or altogether to ward off the fatal effects occaſioned by this caprice of our climate; yet conſidering properly *the nature of clothing*, we may avoid much of the danger. If *ladies* are ſubject to *catch cold* more frequently than men, it is not *alone* their delicacy of conſtitution, or their being more confined within doors; but the frequent changes they make in the quality or quantity of their garments, and ſometimes, however fearful of a partial current of air, becauſe they expoſe even thoſe parts of the body, that a little before had been warmly covered. If a greater proportion of females fall victims to *conſumption*, is it not becauſe, loſing ſight more than men of its primary purpoſe, ſays Dr. Beddoes, they regulate their dreſs ſolely by fantaſtic ideas of elegance? If happily our regret ſhould recall the age of chivalry,—to break the ſpell of *faſhion* would be an achievement worthy the moſt gallant of our future knights. Common ſenſe has always failed in the adventure; and our ladies, alas! are ſtill compelled, whenever the enchantreſs waves her wand, to expoſe themſelves, half undreſſed, to the fogs and froſts of our iſland.

It is, I believe, adds the celebrated Dr. Beddoes, unfortunate for the inhabitants of this country, that we are not ſubject to ſuch a continued ſeverity of cold, as ſhould oblige us regularly to fortify ourſelves by *warm clothing*. By linen worn excluſively, we loſe more in health than we gain in comfort; which comfort is, perhaps, after all, merely imaginary; for from the repreſentation of Dr. Thornton, he appears to have ſupported the remarkable heats of a very hot ſummer, better than moſt other perſons, by having on, inſtead of linen next his ſkin, a *fleecy hoſiery waiſtcoat* *.

It is a miſtaken notion, ſays Sir Benjamin Thompſon, that flannel is too warm a clothing for ſummer. I have worn it, ſays he, in the hotteſt climates, and in all ſeaſons of the year, and never found the leaſt inconvenience from it. Sir Benjamin moreover adds, I ſhall be happy if what I have ſaid or done reſpecting *flannel** ſhould induce others to make a trial of what I have ſo long experienced with the greateſt advantage, and which I am confident they will find to contribute greatly to health, and conſequently to all the other comforts and enjoyments of life. As being the moſt effectual method to eſcape the influence of ſudden changes of atmoſpherical temperature, and becauſe flannel is ſo much leſs unpleaſant, when moiſt, than linen. *Fleecy hoſiery*, or *flannel*, ſhould be worn during every ſeaſon in Great Britain; and thoſe who feel it neceſſary may add above the linen in winter a cotton under waiſtcoat, which he may put off during the warm weather, and reſume again in the autumn. The philanthropic Jonas Hanway was a very great advocate for *warm clothing*. Being in a decline, he was ordered by his phyſicians to the ſouth of France: but ſome very urgent buſineſs calling him to viſit Holland, in the moiſt air of that country he recovered, and remarks that the Dutch are leſs ſubject to this dreadful calamity, which he attributes partly to the air *, and partly to their warm method of clothing. He adds, if a number of perſons meet in a room, where there is no fire, and they feel cold, no pleaſant converſation takes place, and *warm clothing* ought therefore to be uſed, if for no other reaſon than for the preſervation of *good humour.* Boerhaave's favourite receipt for health was, "to leave off our winter clothing on Midſummer day, and to reſume it the day following."

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* Vide his Letters as publiſhed by Dr. Beddoes, in which he adds, "*and ſince my firſt uſing this under garb, I am not* "*ſubject to catch cold as formerly from the viciſſitudes of the* "*weather.*"

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* Had Sir Benjamin Thompſon known the *fleecy hoſiery*, he would moſt probably have recommended it in preference to *flannel*. It *equally* attracts and imbibes the moiſture of the ſkin: but the former as being *elaſtic* embraces the body, as being from an animal ſubſtance is *warmer* and *lighter* for wear than flannel, and as being of a *ſofter texture* does not unpleaſantly and injuriouſly *irritate* the ſkin.

To keep an animal in health, beſide the retaining of a due degree of animal heat †, there muſt be a continued generation of new juices, and a perpetual diſcharge of the old. Without the due quantity of PERSPIRATION, which with us depends very much on our clothing, neither the vegetable nor animal can continue in health; a plant whoſe *perſpiration* is ſtopt becomes ſickly and dies; and an egg whoſe ſhell has been covered with a varniſh, and the *perſpiration* ſtopt by this means, will produce no living

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* Thoſe conſumptive patients, whom *we* hurry off to the clear air in the ſouth of France, the *French phyſicians*, on the contrary, order to the foggy air of Lyons. As they cannot *both* be right, and as the HOT WELLS favours the ſentiments of the latter, being near a great town, where innumerable works are carrying on, and ſituated on the borders of marſhy ground, and a river the moſt choaked up with mud of any in the world, there is ſome probable grounds for doubting of the juſtneſs of *our* prevailing practice. Vide the Section on *Phthiſis Pulmonalis.*

† Vide Sect. III. on the Neceſſity of a due Quantity of Animal Heat to ſupport the Vital Functions, p. 22.

animal

animal either by the application of common heat, or that of incubation from the hen. The celebrated Sanctorius affirms, that the inſenſible perſpiration alone diſcharges more than all the ſenſible evacuations together; and that the proportion of this to all the other evacuations, is as 5 to 3: though this proportion varies in different ages, climates, and conſtitutions, yet is it of ſuch importance in all, that where it is in any conſiderable degree deficient, a diſeaſed ſtate of the body muſt enſue. The matter of *inſenſible perſpiration*, or, in other words, the ſubtle vapour that is continually exhaling from the ſurface of the body, is not ſecreted by any particular glands, but ſeems to be derived wholly from the extremities of minute arteries, that do not terminate in veins, and are every where diſperſed on the ſurface. Theſe *exhaling veſſels* are eaſily demonſtrated in the dead ſubject, by forcing water into the arteries; for then ſmall drops exude from all parts of the ſkin, and raiſe up the cuticle, the pores of which are cloſed by death; and in the living ſubject a looking-glaſs placed againſt the ſkin, is ſoon obſcured by the vapour. When the perſpiration is by any means increaſed, and ſeveral drops, that were inſenſible when ſeparate, are united together, they form upon the ſkin thoſe viſible drops called *ſweat*. This particularly happens after much exerciſe, or whatever occaſions an increaſed determination of fluids to the ſurface of the body; a greater quantity of perſpirable matter being in ſuch caſes carried through the paſſages that are deſtined to convey it off*.

Now the reaſon of the propriety of *fleecy hoſiery* in *ſummer* is, that though it promotes the perſpiration, it equally favours its *evaporation:* and we know that *evaporation* produces *poſitive cold,* the *aqueous diſcharge* being the means deſigned by nature for carrying off the ſuperabundant heat †, whether ariſing from climate, exerciſe, or fever.

In CHILDREN, where the food is continually combining with oxygen, and the fibres are irritable, it is of the utmoſt conſequence to keep the body temperate, but never to ſuffer it to get *chilled.* Thus, without being enervated, they may eſcape the bad conſequences ariſing from the ſudden changes in this inconſtant climate; for it is not true, that cold hardens *children* as it hardens *ſteel.* If delicate children are ſubject to diſeaſes and danger in England, to which they would not be ſubject in the warmer climate of Italy, is it not evident that *the difference* between the climate of England and Italy is the cauſe of theſe diſeaſes and dangers? I firmly believe, ſays Dr. Beddoes, that the greateſt mortality is among thoſe children who are hardily brought up. Nearly one third of the poor, born in this iſland, ſink into the tomb, as ſoon almoſt as they have catched a few glimpſes of the light of heaven. And even when they have weathered out the early inclemencies of their ſtation, unleſs they afterwards wear warm and comfortable clothing *, they enjoy no ſuch advantage of freedom from *pulmonic complaints* as we are taught to imagine. Among the peaſantry of *Warwickſhire* and *Staffordſhire*, I am creditably told, ſays Dr. Beddoes, that *conſumptions* are not leſs frequent, than among the better order of people who are more delicately bred up.

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* We ſhall treat more at large *on Perſpiration,* Sect. VI. page 54.

† Vide Sect. IV. p. 27. "*on the Means* NATURE *employs to rid herſelf of too much internal Heat.*" When dogs are exerciſed, who do not perſpire, they carry off the ſuperabundant heat by the *kidneys,* as well as by the *tongue.*

FAT PEOPLE need a leſs warm raiment than thoſe that are lean; for oil, as being a bad conductor of heat, acts as a fleecy hoſiery waiſtcoat, reflecting back the vital warmth. Here we cannot but admire the benevolent care of PROVIDENCE to the lower order of animals, by giving the whale, the bear, and other animals who inhabit the colder climates, a deep covering of fat.

OLD PEOPLE, as requiring *abundant excitement*, ought more eſpecially to be warm clad, and rather to exceed, than to be deficient in the quantity of their clothing, and to wear that which affords them the greateſt warmth with the leaſt poſſible weight. They will not then be liable to be injured by ſitting all day in the chimney corner, breathing an unwholeſome air, and in a current of wind. A perſon ſufficiently clothed with the *fleecy hoſiery* next his ſkin may wear any ſlight ſubſtance for ornament above it, and will, I am certain, feel more comfortable even at ſome diſtance from the fire, than when he was ſcorching on one ſide, and felt half frozen on the other.

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* No people are better clothed than the *farmers* in this iſland, who uſually enjoy *rude health*.

SECT. VI.

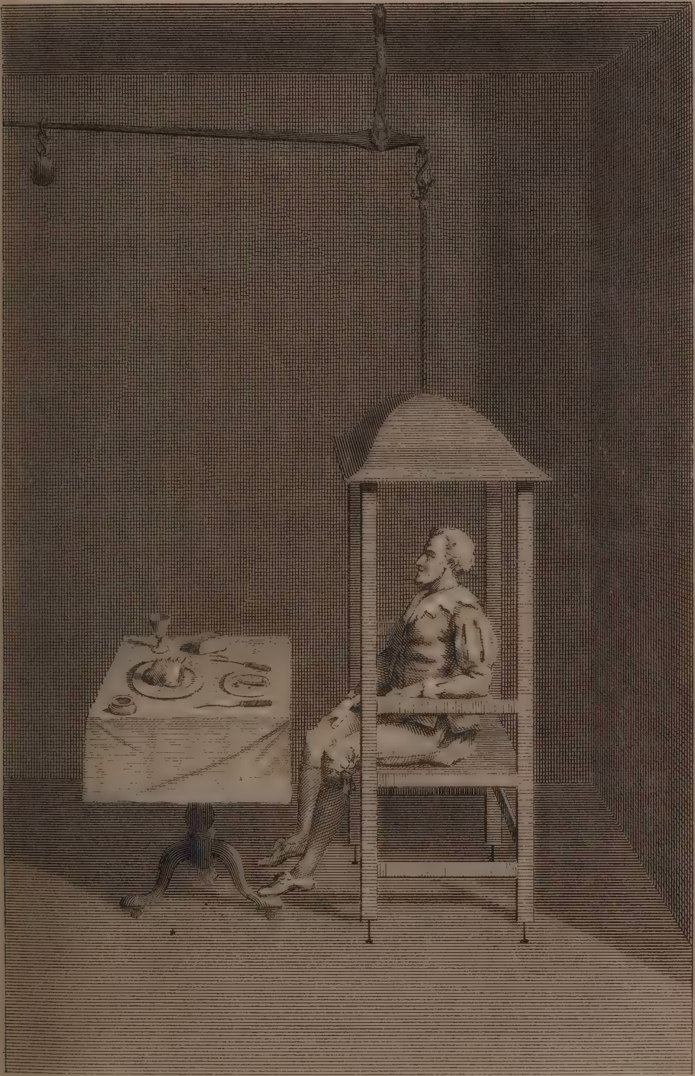
ON PERSPIRATION.

Now all over the ſurface of the body, both where there is true cutis under the cuticula, and where there is not, there is a perpetual exhalation, and a waſte or diſpendium of the liquids in the body, flying off in a ſubtile vapour.

This exhalation, or perſpiration, is called *Sanctorian*, from Sanctorius, a celebrated Italian phyſician, who flouriſhed in the beginning of the laſt century; not that he was the full diſcoverer thereof, but becauſe he was the firſt who applied himſelf to the thorough examination of its quantity by ſtatical experiments; and its proportion to the ſenſible evacuations; and to find out what cauſes either promote or obſtruct it; and what are the conſequences, good or bad, of its increaſe or diminution.

Common ſenſe could not but teach the bulk of mankind that the body perſpired. The fouling of clothes without ſweat; the ſullying of any poliſhed piece of metal or glaſs by the touch, muſt have been early demonſtrations of it.

That there is a perpetual inſenſible exhalation from the ſurface of the body, appears evidently from a variety of phænomena. Hold a poliſhed, dry, clean, rubbed piece of metal, cloſe (without touch-



Lowry, ſculp.

Sanctorius in his balance.

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ing) to any bare part of the body, though not ſweating, in warm weather, and it will be quickly ſullied. Wipe it clean and dry, and hold it again to the part, and the ſame effect will be conſtantly renewed.

Fill a clear drinking glaſs full of cold water (if ſal armoniac is diſſolved in it, the experiment will be the more conſpicuous, and ſatisfactory, becauſe it makes the water colder), and hold it near the bare ſkin, without touching it, and its outer ſurface will be dimmed, by the vapour exhaling from the ſkin being condenſed by the coldneſs of the exterior ſurface of the glaſs. If you put your naked arm into a wide-mouthed chemical glaſs veſſel, very dry, you will ſoon ſee the internal ſurface of the glaſs dimmed with the exhalation from the limb. And if it be kept long enough within the glaſs, there will be ſeen ſtreaks of moiſture trickling down its ſides.

And to mention only another experiment, if a perſon weighs himſelf when going to bed, and again when he riſes next morning, he will often find himſelf conſiderably lighter, though he has made no ſenſible evacuation in that time, either by urine, ſtool, or ſweat.

From all which it is plain, that the body perſpires inſenſibly.

Let us now inquire whence this matter of perſpiration comes; and how the evacuation is made.

The cutis vera, as we have ſaid, is ſupplied with blood veſſels, both arteries and veins. Warm water

injected

injected into an artery, ſuppoſe the axillary artery, reaches to the external ſurface of the ſkin; and being ſtopped by the epidermis, whoſe pores are ſhut after death, raiſes it into little veſicles.

This experiment, compared with the circulation in living bodies, ſhews that the matter of perſpiration is brought by minute arterial tubes to the ſurface of the ſkin; and flies off by pores in the epidermis; though theſe pores are ſo extremely ſmall as not to be ſeen by the help of the greateſt magnifiers.

The experiment before mentioned, of the naked arm kept in the chemical glaſs veſſel, ſhews that water is its baſis. But this water is more or leſs impregnated with animal principles, rendered volatile by the action of the animal heat.—This evidently appears by hounds tracing animals and even their maſters at a great diſtance by the ſcent.

Thoſe parts of the body which have no cutis, and are expoſed to the air, are always moiſt; and if ever ſo well dried, quickly become humid again; therefore their perſpiration is performed by the ſmall arteries continually pouring out their liquids upon them, which the ambient air conſtantly licks up, and would ſoon dry them quite, if there were not a perpetual ſupply of the ſame moiſture.

Inſenſible perſpiration differs in quantity and proportion to the other evacuations, according to the different circumſtances of the individual, in point of climate, diet, and manner of living, age, ſex, and temperament.

It likewiſe varies in the ſame perſon in different ſeaſons of the year, in different parts of the ſame day, and at different ſpaces of time after meals; and is different in ſleep and watching.

And it is affected by exerciſe or reſt; health or ſickneſs; and by the paſſions.

In general, a warm climate, briſk exerciſe, if not immoderate, and beyond the ſtrength, youth, health, and vigour, animal diet, promote and increaſe it.

And the contrary circumſtances tend to diminiſh or obſtruct it.

Men perſpire inſenſibly in a general way more than women; which is owing to the greater vigour of their circulation.

And the young perſpire more than the old, becauſe the circulation in the former is briſker; the veſſels are more yielding and permeable.

We perſpire moſt after a full meal, when the digeſtion in the primæ viæ is nearly completed, and the blood is moſt turgid with new chyle, which is now attenuated enough to let its aqueous and volatile parts fly off. Immediately after eating, while the ſtomach is labouring in the work of concoction, we perſpire leſs than before; but in an hour or two we begin to perſpire plentifully; and continue ſo to do for ſome hours, till the veſſels begin to be empty and the pulſe ſinks.

We perſpire more in the warm part of the day, than in the mornings and evenings. Our pulſe is raiſed by the increaſed heat of the atmoſphere, and our bodies heated of courſe. Heat increaſed promotes evaporation; and by the pulſe being raiſed, a greater quantity of perſpirable matter is brought to the exhaling veſſels of the ſkin, in a given time.

It hath been much diſputed whether we perſpire moſt ſleeping or awake. Sanctorius, by his experiments, makes perſpiration greateſt in ſleep: Keill, in his Medicina Statica Britannica, makes it conſtantly leaſt. The truth of both the facts, as they obſerved them, is not to be called in queſtion; but how are they to be reconciled?

The Italians, as well as the French, make ſupper their principal meal: but the Engliſh make their dinner their chief meal. Now, as we obſerved before, perſpiration begins to be increaſed ſome little time after the ſtomach is filled; and continues to be plentiful till the veſſels become empty: ſo that, with Sanctorius, the time of the greateſt perſpiration from eating, coincided with the middle of the time of ſleep; whereas with Keill, who often mentions his going to bed ſupperleſs, and commonly ſat up late, that time of the greateſt perſpiration ariſing from eating was over before his bed-time. We are likewiſe here to take in abſorption, of which we ſhall ſay more by and by; which, *cæteris paribus*, is greateſt when the air is moiſteſt, and when the veſſels are emptieſt; and therefore no doubt is greater in England than in Italy; and is greater in the night than in the day-time; and greater in one who goes to bed with an empty, than with a full ſtomach.

You may perhaps be curious to know in what manner Sanctorius made his ſtatic experiments. He had a chair hanging by a ſhort beam, near the centre of motion; the beam was continued to a ſufficient length, marked at certain diſtances, in the ſame manner as ſtilliards are, by which means a ſmall weight, at a great diſtance from the center of motion, might be in æquilibrio with, or outweigh the chair, and himſelf ſitting in it. He knew the weight of his chair, and of his clothes; having weighed himſelf immediately before, and immediately after eating, he of courſe found the weight of all the aſſumpta. And weighing himſelf immediately before he had any evacuation, he knew their weight, without the uncleanly drudgery of weighing them. By weighing himſelf at different times, when he had neither eat nor drank, and had been without any ſenſible evacuation during the intervals of weighing, he found the quantity of perſpiration produced in theſe intervals.

Sanctorius makes inſenſible perſpiration equal to five eight parts of the whole aſſumpta.

Keill finds it, at a medium, rather under one half of the aſſumpta.

Dodart and Gorter, the latter living in Holland, the former in or near Paris, make it ſomewhat larger than Keill; but nearer the proportion he gives, than that of Sanctorius.

The uſe of inſenſible perſpiration in the animal œconomy ſeems to be firſt to give vent to the oily and ſaline parts of the blood and humours; which, after having undergone the effects of repeated circulation, if retained, would in time become too acrimonious, volatile, and exalted, to be conſiſtent with that mild balſamic nature in the juices, which is neceſſary to keep up health, and durable life. And ſecondly, as theſe are expelled, intimately mixed with and diſſolved in an aqueous vehicle, highly attenuated, and in the form of vapour, the ſteam, while it paſſes, muſt of courſe moiſten and lubricate the corpus reticulare and epidermis; and likewiſe the nervous papillæ, preſerving the latter in a fit ſtate for ſenſation.

Sweat may be reckoned and termed ſenſible perſpiration. It ariſes from the ſame emiſſaries that perſpiration comes from, there being no good reaſon to think the outlets of theſe two diſcharges to be different. Sweat is produced when the ſmall exhaling arteries, which naturally carry off the matter of inſenſible perſpiration, are ſo dilated as to let paſs a ſenſible fluid.

While perſpiration continues plentiful, and at the ſame time the body feels light and active, good health is prognoſticated, becauſe in this ſtate the humours muſt be ſufficiently attenuated, to part with ſo many ſubtle and volatile parts; and all the veſſels, from the largeſt to thoſe that carry off the perſpirable matter, which are among the ſmalleſt of all in the animal body, muſt continue tight and permeable; and conſequently concoction, circulation, and the various ſecretions muſt be duly carried on. But no doubt perſpiration may be too great, and weaken, by an over diſſipation of our fineſt fluids. Obſtructed perſpiration, by penning up the oils and ſalts of the blood and juices, after they are become acrid by the action of the animal machine, is very probably a frequent cauſe of irritation. But Keill's tables ſhew, that in our climate health doth not ſo critically depend upon the regularity of perſpiration, as one, by reading Sanctorius, would be apt to believe; and that the latter may be often very much diminiſhed, without any remarkable bad conſequence. If things were otherwiſe, how could ſuch a variety of buſineſs be carried on in our climate by travellers, all the hours of day and night, by land and by water, in all kinds of weather, which ſo much influences perſpiration, and is ſo variable and inconſtant, as not ſeldom to be violent in extremes within the compaſs of a few days, and ſometimes hours? We are ſo made, that, while the body is in health, and vigorous, the defect of one evacuation is made up by the increaſe of another, and things ſet right. Upon the whole, I am apt to believe, that too much is imputed to obſtructed perſpiration, in daily practice; and that the aſſigning of that cauſe is often the refuge of ignorance.

SECT. VII.

ON THE QUANTITY PERSPIRED.

Sanctorius deſerves great commendation for the prodigious pains he took in ſo nicely and minutely obſerving, for ſo long a ſpace of time, the different changes of the quantity of perſpiration upon different occaſions.

But is it not amazing, that in thirty years ſpace, he ſhould never once have thought on inhalation, or reſorption from without? If inhalation, or reſorption, is not conſidered, it is plain, that only the apparent, not the real quantity of perſpiration can be found by ſtatical experiments. If, for example, the body, after ten hours, is found lighter than it was by ten ounces, without any ſenſible diſcharge, it doth not follow, that juſt ten ounces, and no more, are exhaled during that ſpace, becauſe two or three ounces might have been gained in the ſame time by the way of reſorption; in which caſe, the real quantity of perſpiration is not ten, but twelve or thirteen ounces, ſo that weighing the body ſhews only the exceſs of the latter above the former, as Dr. Arbuthnot hath, and I believe the firſt, diſtinctly and explicitly taught.

A lad, at Newmarket, having been almoſt ſtarved in order that he might be reduced to a proper weight for riding a match, was weighed at nine o'clock in the morning, and again at ten o'clock, and he was found to have gained near 30 *ounces* in the courſe of an hour, though he had only drank *half a glaſs* of wine in the interval*. A gentleman in the city was lately weighed before dinner, and was highly offended to find from his weight, not long after dinner, that he muſt have eat, unleſs ſome deceit was played on him, above *two pounds* of beef-ſteaks, ſo much had he increaſed in weight.

In the year 1779, Dr. Ingenhouſz diſcovered that the animal body threw out azotic, and fixed, airs. In the very ſame year, Mr. Cruikſhanks, the celebrated author of a work on the abſorbent ſyſtem, and Lecturer on Anatomy in London, publiſhed a ſimilar diſcovery; and in juſtice to both characters, I muſt obſerve, as I heard from Dr. Ingenhouſz, that their reſpective works were in the preſs at the ſame time. This however is not the only inſtance of two perſons, ignorant of each others purſuits, happening to hit upon the ſame thing. Nothing was more ſimple than the experiment of theſe philophers; the hand was immerſed under quickſilver and the bubbles of air collected, and it was diſcovered, that the diſcharge from the ſurface of the body was,

1. Two parts *fixed air*.
2. One part *azotic air*.
3. A quantity of *aqueous fluid*, which contained the different ſalts of the body.

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* From Dr. Watſon's Chemical Eſſays.

To theſe diſcoveries, confirmed by Mr. Abernethy, Lecturer on Anatomy at Bartholomew's Hoſpital, was added an important fact, that the abſorbents had the power of ſeparating the oxygen air from the azotic, that is, of decompoſing our atmoſphere, as alſo of abſorbing fixed and other airs.

EXPERIMENT I.

Thermometer between 50° *and* 60°.

I filled and inverted, ſays Mr. Abernethy, a jar in quickſilver, and threw up into it one meaſure of atmoſpheric air, which could contain ſeven ounces of water. The quickſilver was depreſſed two inches and a half from the top of the jar. After moving my hand ten minutes beneath the ſurface of the quickſilver, to detach any common air which might adhere to it, I put it up into the air in the jar, and there retained it for the ſpace of an hour. Before I withdrew my hand, I depreſſed it beneath the ſurface of the quickſilver, ſtill keeping it within the glaſs, and agitated it in this ſituation, for ten minutes; this was done that I might not remove any of the air, which was the ſubject of the experiment. The ſame conduct was purſued in all the ſubſequent experiments. After five hours expoſure of the hand to this air, the quantity in the glaſs was *diminiſhed* about *half an ounce*. It might have been expected that the *perſpiration* would have increaſed the bulk of the air, but in this experiment, the *ab-ſorption* ſeemed to ſurpaſs in quantity the ſecretion.

I now threw up into the jar lime water, by which nearly an ounce of air was rapidly abſorbed, and the lime was precipitated; the remaining air being examined by the addition of nitrous gas, was found to contain nearly one-ſixth leſs of oxygen gas, than it did before the experiment.

In another ſimilar experiment, after the hand had continued nine hours in the air, I found more than one ounce meaſure of carbonic gas, or fixed air, had been produced, and the remaining air being examined by the eudiometer, contained one-fourth leſs of oxygen than before the experiment.

It might, perhaps, here be inquired, does the oxygenous gas of the atmoſphere contribute to the formation of the carbonic gas?—Both reaſon and experiment reply that it does not, for if oxygenous gas combined with carbon on the ſurface of the ſkin, much heat ſhould be produced at the time of their combination; but this production of heat is not found to take place. Experiments alſo ſhew that carbonic gas is perſpired from the veſſels, for into whatever air the hand be immerſed, the quantity of carbonic gas given out will be nearly the ſame. This is a point which I have determined by careful experiment.

EXPER. II.

Having filled and inverted a jar in quickſilver, I put up into it a ſeven ounce meaſure of *azotic gas*. I purſued the plan related in the former experiment, to avoid adding to, or abſtracting from, this air. After two hours expoſure of the hand, on throwing up lime water a rapid and conſiderable diminution of air followed; ſo that rather more than an ounce of carbonic gas was produced, when no oxygen was preſent. The increaſe of the quantity of carbonic gas is accounted for in this experiment, by the heat of the atmoſphere being greater, which diſpoſed the ſkin to more copious perſpiration.

I made ſimilar experiments with the *hydrogenous* and *nitrous gaſes*; in theſe an equal quantity of carbonic gas was produced; and when the hand was ſurrounded by oxygen, the quantity of carbonic gas was not much greater.

EXPER. III.

Thermometer about 50°.

I next wiſhed to diſcover what effect the action of the hand would produce on carbonic gas.

Into a glaſs jar filled with, and inverted in quickſilver, I introduced ſix ounces of *carbonic gas*, and expoſed my hand to it, for the ſpace of nine hours, in the manner, and with the precautions, before related. In that time the air was reduced in quantity to leſs than three ounces. A portion of the carbonic gas was examined, by the addition of lime water, before the experiment, when it was almoſt wholly abſorbed; an unexaminable bubble only remained. When the remaining gas was examined by lime water, after the experiment, a conſiderable quantity of *azotic gas*, which doubtleſs exhaled from the hand, was found mixed with it.

I twice repeated this experiment, with ſimilar events, though with rather leſs diminution in the quantity of carbonic gas: it was however ſufficiently evident, that the abſorption of this gas, by the ſkin, was very copious and rapid.

EXPER. IV.

Thermometer 80°.

The abſorption of carbonic gas makes it difficult to aſcertain preciſely the quantity perſpired, ſince that gas which is thrown out from the body by ſecretion, will probably be readmitted by abſorption. I therefore wiſhed to diſcover the quantity of carbonic gas perſpired in one hour.

The hand being retained one hour in five ounces of nitrous gas, no aſcent nor depreſſion of the quickſilver was remarked. On the introduction of lime water into the glaſs, *ſix drams* of carbonic gas were abſorbed.

In

In a ſimilar experiment with atmoſpheric air, after the expiration of an hour, the quickſilver had rather riſen, and *three drams* of carbonic gas were diſcovered by lime water. . In another experiment, in which hydrogenous gas was employed, *four drams* of carbonic gas were found at the termination of an hour.

All the laſt related experiments were performed in very hot weather. If two drams of carbonic gas were emitted in an hour, as the quantity uſually obtained in five hours was but one ounce, it would be a ſufficient demonſtration of the abſorption of a part of the air perſpired. Neither are theſe experiments concluſive as to the preciſe quantity of air emitted, for even in an hour part of that which is exhaled will be again imbibed. When I firſt attempted the experiments with carbonic gas, I ſuppoſed that the abſorbents would receive it reluctantly, for I thought that matter which was thrown out from the ſkin in ſuch quantities, could neither be requiſite, nor ſalutary to the body. The experiment proved that I was miſtaken, and there are reaſons which tend to ſhew the ſalubrity of this gas. When it is admitted into the ſtomach, it is generally found beneficial. When employed as a local application, its ſtimulus is uſeful, and when in combination with the blood, it probably produces equally ſerviceable effects.

EXPER. V.

Thermometer between 60° *and* 70°.

The experiments that have been related, indiſtinctly ſhew, that a ſmall quantity of one kind of air, when mixed with a larger proportion of another, can be abſtracted from it by the action of the animal body. This circumſtance will be hereafter fully proved. I will now relate an experiment that was made in ſupport of this opinion, as it was performed beneath quickſilver, and in the ſame manner with thoſe which immediately precede it.

Into a jar filled with, and inverted over quickſilver, three meaſures of *azotic* gas and three of *carbonic* were introduced; the two airs depreſſed the quickſilver two inches and a half, and occupied the ſpace of ſeven ounces of water. After five hours expoſure of the hand, the air contained in the jar filled the ſpace of only five ounces and a half of water; on putting up lime water to this air, it was diminiſhed to three ounces. In this experiment one ounce and a half of carbonic gas appears to have been removed, and half an ounce of azot; but if you admit that one ounce of carbonic gas was perſpired during this experiment, and one third of an ounce of azotic, the quantity of air eſtimated to be abſorbed is increaſed, but the proportions remain unaltered.

EXPER. VI.

Thermometer 60°.

In the experiments with common air I have mentioned, that it contained leſs oxygen after it had undergone the operation of the hand, than before it became the ſubject of experiment. A queſtion here occurs, does this variation proportionably ariſe from the addition of the one gas, or the removal of the other? That it is owing to abſorption, will, I believe, be evident, from the following experiments. Although the addition made to any kind of air, cannot be accurately aſcertained when water is employed, yet if the hand removes any portion of air, that removal will be aſcertained by examination, neither does the experiment appear liable to deception. In the experiments next related the air was confined by water; this gave me an opportunity of uſing larger veſſels, and expoſing a greater extent of ſurface of the ſkin to the contact of the air. I forbore particularly to remark the quantity of air abſorbed in the foregoing experiments, for though it correſponded to thoſe which I ſhall next relate, yet the correſpondence was not uniform, and the degree of abſorption was leſs evident.

I filled and inverted a jar in water, and put up into it twenty-four ounces, by meaſure, of *atmoſpheric* *air*; to this the hand was expoſed for twelve hours, the ſame precautions being uſed to avoid adding to, or taking from the air contained in the jar. The water had riſen in the veſſel, and about two ounces and a half of the air were removed; that which remained was examined by the eudiometer, when two meaſures of it, and one of nitrous gas, filled the ſpace of nearly two meaſures, and one third of another; it therefore follows, that about one half of the uſual quantity of oxygenous gas was removed from the other part of the atmoſphere. That there could be no addition of nitrogenous gas capable of ſo greatly altering the proportions of theſe gaſes, muſt, I think, be too evident to need argument for its proof. Similar experiments were afterwards made with correſpondent events. In the experiments made under quickſilver, the abſtraction of oxygen was equally evident, and conſiderable; it therefore appears, that the animal body is capable of taking away the oxygen, when in intimate mixture, with a much greater quantity of azot. The avidity with which oxygen is abſorbed, will be made ſtill more conſpicuouſly evident by the following comparative experiment.

EXPER. VII.

I filled and inverted two jars in water, into one I put twenty-four ounces by meaſure of *azotic* gas, into the other the like quantity of *oxygen*. The hand was put into theſe airs alternately, and retained there for an hour each time: after it had been expoſed to each for eight hours, the water roſe one-eighth of an inch in the bottle containing the azotic gas, and nearly a whole inch in that containing the *oxygen*. On eſtimating the quantity removed, by weighing the water which filled the bottles to the different marks, it appeared that *one twentieth* part only of the *azotic gas* was removed, but *one-third* of the *oxygenous gas* was gone. The remaining oxygenous gas was found to contain one eighth more of azotic gas than before the experiment. I next examined the degree of celerity with which other gaſes would be imbibed.

EXPER. VIII.

Having filled and inverted a jar in water, and put into it thirteen ounces of *nitrous gas*, I retained my hand in this air, at different times, five hours, in which time three ounces were abſorbed. My hand being retained for as many hours in a like quantity of *hydrogen gas*, not more than one ounce and a half was removed.

The removal of a quantity of *oxygen gas* from common air, is ſurely a curious circumſtance; if this be the effect of an action in the abſorbing veſſels, it muſt much exalt our ideas of their ſubtility, and their aptitude, or diſpoſition, to admit one ſpecies of matter, and to reject another. That the abſtraction of one air, in preference to another, depends upon this cauſe, I believe will not, on reflection, be doubted; it might indeed be ſuſpected, that oxygenous gas was ſeparated from the atmoſphere by the ſkin, as it is in the lungs by chemical attraction: but it has been proved that *carbonic* gas is removed with equal celerity; and experiments on animal ſubſtances ſhew in them a diſpoſition rather to part with than to imbibe carbonic gas. The removal of this air is therefore not likely to be the effect of chemical affinity. The different degrees of celerity with which other gaſes are admitted, ſeem to eſtabliſh the opinion, that the removal of one kind of air in preference to another is the effect of an active *ſelecting power* in the abſorbing veſſels.

The experiments which have been related ſatiſfactorily prove the quality of the aeriform perſpiration; perhaps the proportions may occaſionally vary, but, as nearly as I can determine, it conſiſts of rather more than *two parts* of *carbonic*, with the remainder of *azotic gas*. The quantity of the matter perſpired is with leſs certainty aſcertained; in one hour I obtained *four drams of carbonic gas*: but it ſhould be remembered, that theſe experiments were made in very hot weather; and it alſo deſerves notice, that the quantity of the cutaneous perſpiration is ſubject to great variety. In every experiment *abſorption* was found to be equal to *perſpiration*, in many it was much more copious; eſpecially when the air to which the ſkin was expoſed was ſalutary to the conſtitution.

ſtitution. The *oxygenous* and *carbonic* gaſes are very readily imbibed; whilſt the *nitrous*, *hydrogenous*, and *azotic* gaſes, tardily gain admittance into the abſorbing veſſels. In Experiment V. from about half of the ſurface of the hand two ounces and a half of carbonic gas were abſorbed in five hours; in other Experiments, from the hand and wriſt there was imbibed,

In eight hours	8 ounces	of	oxygenous gas.
In five hours	3 do.	-	nitrous gas
In five hours	1½ do.	-	hydrogenous gas.
In eight hours	1 do.	-	azotic gas.

EXPER. IX.

Thermometer 65°.

I next endeavoured to aſcertain the quantity and quality of aqueous perſpiration.

I introduced my hand and fore-arm into a glaſs jar, covered with bladder; an aperture was left in the bladder, to admit my arm, round which the bladder was tied; ſo that the aſcent of any vapour was prevented. In ſix hours I procured nearly *three drams* of limpid taſteleſs *water*. The quantity collected correſponds with the reſult of Mr. Cruikſhank's experiments, who obtained the water of perſpiration in the ſame manner. Half of this liquid was evaporated by a gentle heat; there remained a ſmall reſidue on the glaſs, which had a very ſlight taſte of *ſalt*. The other half was ſuffered to ſtand many days, in which time no change appeared: it did not then alter the colour of the vegetable blue. Into one portion of this watery liquor marine acid was dropped, which cauſed no coagulation, or precipitation of animal matter: into the other ſome cauſtic alkali was poured, which produced no viſible effect. I therefore conclude that the water of perſpiration, in a ſtate of health, contains little, or any thing, except a very ſmall portion of ſalt.

Perſpiration is generally ſaid to be ſenſible, or inſenſible; perhaps it may be better diſtinguiſhed as *aeriform*, or *watery*. It may be expected, that a general eſtimate of the quantity of this ſecretion ſhould be attempted; but the difficulties which oppoſe any accuracy of ſtatement are conſiderable. In theſe experiments the proceſs was not continued under its uſual circumſtances; the arm was ſurrounded by water, or quickſilver; and when in the latter fluid, the circulation was in ſome degree interupted by its aſcenſion, and preſſure againſt the edge of the jar.—For the uncertainty which theſe circumſtances occaſion, allowance muſt be made, but before an eſtimate of the quantity of perſpiration be attempted, the extent of the ſurface of the body ſhould be known. Mr. Cruikſhank ſuppoſes the extent of the hand to be to that of the body as one to ſixty: it is much more, according to my computation.

After ineffectually endeavouring in different ways to meaſure the ſurface of the body, I concluded that I ſhould approach neareſt to its true extent by meaſuring the circumference of the trunk and limbs at different parts, and having thus obtained the mean circumference, I could then calculate the extent of their ſurface, as if they were cylinders, the dimenſions of which were aſcertained. The ſurface of the head, hand, and foot, I computed, by applying paper, cut as the occaſion required, over theſe parts: afterwards placing the ſeparate pieces of paper ſo as to form an extended plane, I meaſured its extent. I ſhall mention theſe meaſurements, that the reader may correct them if he ſhould think them in the leaſt erroneous. If a man be five feet ſix inches high, I will ſuppoſe the mean circumference of the trunk of his body to be thirty-three inches, and its length, from the top of the ſternum to about the hip, twenty-two inches.

	Square Inches.
The extent of ſurface of the trunk will therefore be - - - - - - - - - - -	726
The circumference of the neck 13 inches, its length from the ſternum to the chin 3 inches	39
The ſurface of the head, and back of the neck	286
The mean circumference of the arm 10 inches, its length 12. Surface of both arms - -	240
The mean circumference of the fore-arm 8 inches, its length 10. Surface of both fore-arms - - - - - - - - -	160

The

The ſurface of the hands and wriſts meaſuring to the extremities of the bones of the fore-arm	140
The mean circumference of the thigh 17 inches, its length 16. Surface of both thighs	544
The mean circumference of the leg 11 inches, its length 14. Surface of both legs - -	308
Surface of both feet - - - - - - -	182
Allow for folds of the ſkin, inequalities of the ſurface, &c. - - - - - - - -	175
The extent of the ſurface of the body will be	2700

The ſuperficial extent of the hand and wriſt, according to this calculation, is to that of the body as one to about thirty-eight and a half.

In Experiment IV. the leaſt quantity of *carbonic gas* emitted from the hand, in one hour, was three drams by meaſure; it may be ſuppoſed that the heat of the weather increaſed the ſecretion from the ſkin, let us therefore conſider two drams as the ordinary quantity. If then the perſpiration of all parts were equal, *ſeventy-ſeven dram meaſures* of *carbonic gas* and *one third* of *that quantity* of *azotic gas*, would be emitted from the body in the ſpace of *one hour*. If we alſo ſuppoſe perſpiration to be at all times equal, nearly *three gallons of air* would be thrown out from the body in the courſe of *one day*.—Although the quantity of air perſpired is ſo large, yet the weight of the body will not be much altered by its loſs; it is the *aqueous perſpiration* by which this will be principally diminiſhed. When the thermometer was between 60° and 70°, I obtained about *thirty* *grains* of *fluid* from my hand and part of the fore-arm in an hour; the ſurface from which this ſecretion was made I compute to be one twenty-fifth part of the extent of the body. The ſuppoſition being allowed, that perſpiration is at all times, and in every part, equal, about *two pounds and a half* is the loſs of *water* which the body would in one hot day ſuſtain. In moſt of the experiments which I have made, the *abſorption* of air was equal to the *perſpiration*; in many, it was much greater, eſpecially if the air was ſalubrious to which the ſkin was expoſed. Experiment VI. makes it appear probable, that if the *naked body* was expoſed to freſh currents of the atmoſphere, that only the *oxygenous* part would be abſorbed; the decompoſition of which, in the body, would produce an increaſe of animal heat; which might, in ſome degree, make up the loſs ſuſtained by the expoſure. Our *clothing* probably prevents, very much, this effect, and perhaps makes it leſs neceſſary. If the perſpired *carbonic gas* be confined by our garments, it ſeems likely that it will be taken up again by the abſorbents. Whether the body does uſually imbibe *water* from the atmoſphere, adequate to the loſs ſuſtained by aqueous perſpiration, is uncertain. But I am inclined to ſuppoſe, that the abſorption of *air* from the ſkin is nearly equal to the ſecretion*.

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* The Reader is requeſted to turn to page 126, Sect. XII. On Cleanliness, which ſhould have followed, but has ſomehow, or other, got miſplaced.

OUR
RELATIONSHIP
TO
FOOD.

SECT. VIII.

ON FOOD.

At firſt, the food taken into the ſtomach retaining its peculiar properties, *irritates* the inner coat of that organ, and occaſions a contraction of its two orifices. The food, thus confined, then undergoes a conſtant agitation by means of the abdominal muſcles, and of the diaphragm, and by the motion of the fibres of the ſtomach itſelf. By theſe movements, every part of the food is expoſed to the action of a fluid ſecreted in the ſtomach, called *the gaſtric juice*, which (as water diſſolves ſugar) gradually diſſolves and attenuates the food (as preſently will be proved*), and prepares it for its paſſage into, and farther change in, the inteſtines.

The painful ſenſation of *hunger*, which is the irritation of the gaſtric juice on the inner coat of the ſtomach, or the ſenſation of a defective ſupply of chyle in the arterial ſyſtem†, being removed by the food, we ſoon feel a mild and undeſcribable delight, firſt from the ſtimulus of the aliment; and ſecondly, from the diſtention of this, and the increaſed action of other parts.

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* Vide the next Section.

† Nothing better illuſtrates this, than what happened to Admiral Byron, Captains Cheat and Hamilton, when ſhipwrecked on the weſt coaſt of South America; who, after ſuffering months of hunger and fatigue, were reduced to ſkin and bone. A table, ſays Byron, was ſpread out for us by the Indians,

If it ſhould ſeem ſtrange that *pleaſure* ariſes from *the ſtimulus* of food on the ſentient nerves of this important organ, let us recollect only the effect of a moderate doſe of *opium* to thoſe unaccuſtomed to *that ſtimulus.* They are commonly ſo tranſported with the pleaſing ſenſation it induces, that they feel, as they oftentimes expreſs themſelves, as though they were in heaven, and enjoy ſo perfect a pleaſure, that no happineſs in the world can ſurpaſs the charms of this agreeable ecſtaſy. On the other hand, what a terrible agony will two or three grains of *crocus metallorum* throw the whole fabric into? this part being of ſo acute a feeling, that ſome philoſophers have for this reaſon thought it to be the ſeat of the ſoul itſelf.

Beſides this conſideration, we muſt here take notice, that the ſtomach, being diſtended with food, preſſes on *the ſpleen**, and thereby occaſions a greater

Indians, with cold ham and fowls, which only we *three* ſat down to, and in a ſhort time we diſpatched more than *ten* men with common appetites would have done, and yet we complained of being *unſatisfied.* For a long while we got up two or three times in the night to cram ourſelves. Captain Cheat uſed to declare, that he was quite aſhamed of himſelf.

* The true office of the SPLEEN was *the happy diſcovery* of the ingenious Dr. Haighton, Lecturer on Phyſiology to the Pupils

greater quantity of blood to paſs into the *pancreas*, and conſequently a greater increaſe of the ſecretion from that viſcus;—and by obſtructing in ſome degree the paſſage of blood in the deſcending trunk of the *aorta*, cauſes an increaſed flux of blood to the *head*, and hence, after a full meal, inactivity and drowſineſs* and ſometimes apoplexy† enſue; and hence alſo proceed thoſe fluſhings or redneſs in the face, ſo conſpicuous in weak and exhauſted perſons, after eating.

We will now attempt to trace the food in its digeſted form, after it is thrown out from the ſtomach into *the inteſtines*.

The aliment having remained during two or more hours in the ſtomach, is converted, firſt, into a greyiſh pulp, which is uſually called *chyme*. This chyme, or fluid, paſſes out of the *pylorus*, or right orifice of the ſtomach, the fibres of which relax to afford it a paſſage; while the groſſer and leſs altered particles remain in *the living retort*, to adopt the expreſſion of the reverend Mr. Townſend, till they acquire

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Pupils of Guy's and St. Thomas's Hoſpitals. It did not eſcape the penetrating mind of the Reverend Mr. Townſend, and this coincidence of thought is a further proof of its truth. See *the Guide to Health*, page 33.

[*] Mr. Brindley, the famous canal engineer, mentioned to Dr. Darwin that he had more than once ſeen the experiment of a man extending himſelf acroſs the large ſtone of a corn-mill, and that by gradually letting the ſtone whirl, the man fell faſt aſleep. Dr. DARWIN.

[†] See *the Guide to Health.*

a ſufficient fluidity, to paſs into the inteſtinal canal. As the digeſted food enters the *duodenum*[*], it ſtimulates the common duct of the *gall bladder* and the *liver*, and from a law in the animal œconomy, which has given the higheſt ſenſibility to the nerves at the mouths of the ſeveral ducts, which, by a ſympathetic communication, occaſions their ſeveral glands either to ſecrete or pour out a greater quantity of fluid, the *chyme* receives a full ſupply of *bile*, and of *ſaliva*, ſecreted from the *pancreas* [†]; it alſo intermingles with *mucus* from innumerable exhalent arteries, which ſtill farther animalizes the chyme.

The *inteſtinal canal* is five or ſix times as long as the body, and forms many circumvolutions in the cavity of the abdomen, which it traverſes from right to left, and again from left to right. The inner coat of the inteſtines, by being more capacious than their exterior tunics, occaſions a multitude of *plaits*[‡], at certain regular diſtances from each other, and

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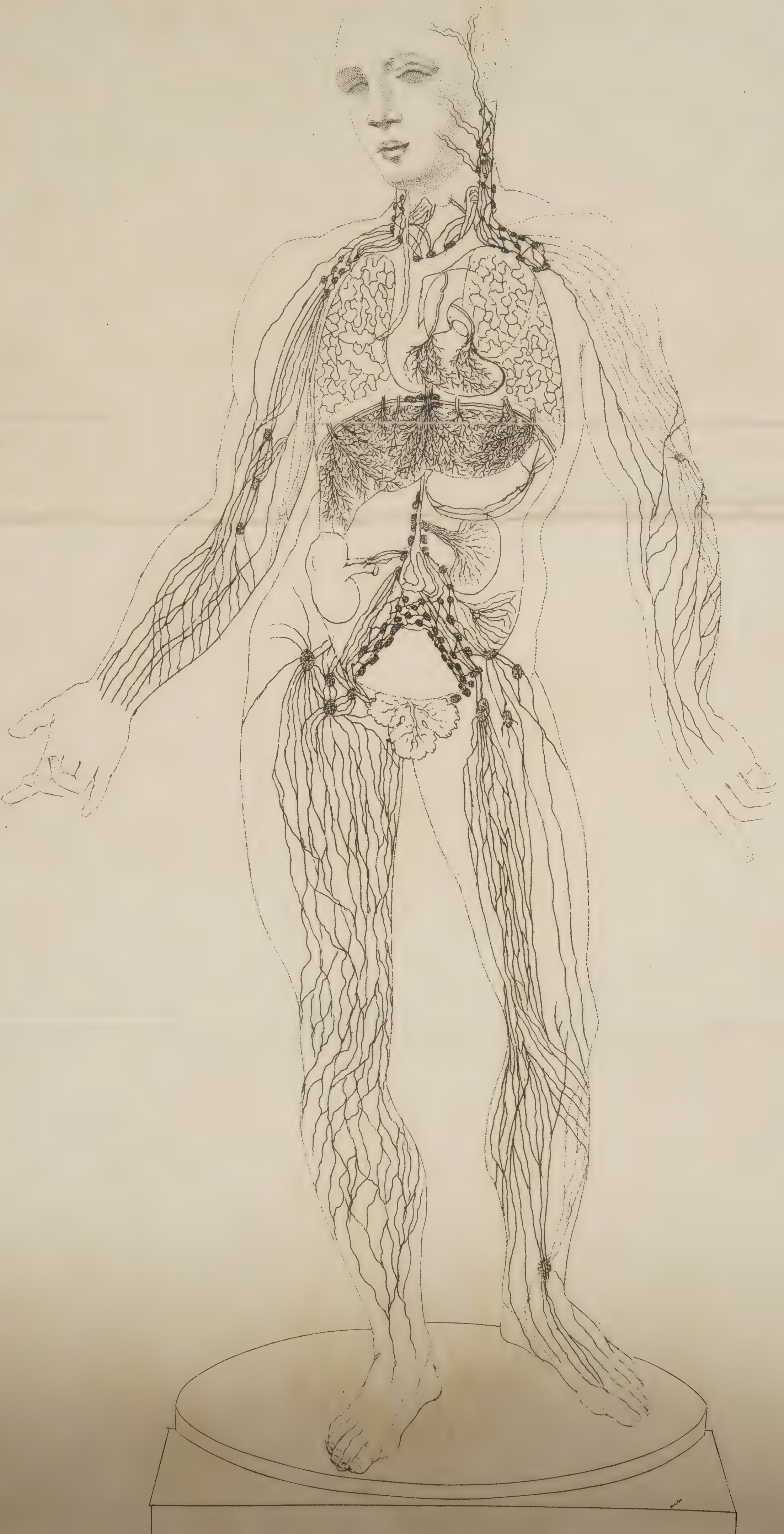
[*] Vide the Map of the Viſcera.

[†] The *pancreas* is a large gland, which lies near the ſtomach, and diſcharges by a ſhort duct, into the inteſtines, a liquor, which it ſeparates from the blood. It is difficult to collect any quantity of this juice, becauſe it is not lodged in any particular receptacle, but flows from the gland into the inteſtines, near the upper orifice of the ſtomach. However in dogs this has been executed by tying a bottle near the duct of the gland, while the animal was living, by which a quantity of the juice has been collected, and found in appearance to reſemble the *ſaliva*.

[‡] Called by anatomiſts *valvulæ conniventes*.



THE ABSORBENT SYSTEM

From M^r. Cruikshank's admirable History of the Absorbents.

theſe become leſs and leſs, and at farther intervals as they deſcend. This diſpoſition will be found to afford a ſtill farther proof of that divine wiſdom, which the anatomiſt and phyſiologiſt cannot fail to obſerve in all their purſuits; for if the inteſtinal canal was much ſhorter than it is; and if its inner ſurface was ſmooth and deſtitute of plaits; the aliment would conſequently paſs with great rapidity to its termination, and ſufficient time would be wanting to aſſimilate the chyme, and for the neceſſary abſorption of it by the numerous *villi*, or hair-like projections which terminate in *lacteals**: ſo that the body, unleſs conſtantly replenïſhed, would be deprived of the ſupply of nutrition, which is ſo eſſential to life and health :—but the length and circumvolutions of the inteſtines, the inequality of their internal ſurface, and the courſe of the aliment through them, all concur to perfect the ſeparation of the chyle from the facæs, and to afford the neceſſary nouriſhment to the body.

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* I think I have proved, ſays the illuſtrious Dr. Hunter, that the lymphatic veſſels are the abſorbing veſſels, all over the body; that they are the ſame as the lacteals; and that theſe altogether, with the thoracic duct, conſtitute *one great* and *general ſyſtem*, diſperſed through the whole body for abſorption; that this ſyſtem *only* does abſorb; that it ſerves to take up, and convey, whatever is *to make*, or *to be again mixed with the blood*, from the inteſtinal canal, from the ſkin, and from all the internal cavities and ſurfaces whatever. In our times, after ſchools of anatomy have long flouriſhed in all the civilized nations of Europe, and when, from the number of men who have been employed in ſuch reſearches, it might have been imagined that diſcoveries were exhauſted, PROVIDENCE has allowed me a greater ſhare of that ſort of honour, than at firſt I could have expected. My diſcovery of the ABSORBENT SYSTEM gains credit daily, both at home and abroad, to ſuch a degree, that I believe we may now ſay, that it is almoſt univerſally adopted: and, if we miſtake not, in *a proper time*, it will be allowed to be the *greateſt diſcovery*, both in *phyſiology* and in *pathology*, that anatomy has ſuggeſted, ſince the diſcovery of the circulation of the blood.

Having ventured to throw out, continues Dr. Hunter, ſo bold a propoſition, that my reputation may not ſuffer through want of a little reflection upon the ſubject, I muſt beg leave to explain my opinion. The diſcovery of a duct of a gland, an undeſcribed muſcle, an artery, or a concealed vein, all ſuch diſcoveries certainly are trifling, when compared with the introduction of a *new* and *general ſyſtem,* which is interwoven with, and performs a peculiar and important function in every part of the body; ſo *important,* indeed, that it was neceſſary, and accordingly has ſince actually been found out in brutes, likewiſe in birds, and in fiſh. *Such is the diſcovery* of the ABSORBENT SYSTEM: and every perſon, who is really an anatomiſt, or phyſiologiſt, will, upon a little reflection, admit what has been here advanced; and, looking over the whole progreſs of anatomy, he will allow, that ſince the time of Ariſtotle to the preſent day, there have been only *two great diſcoveries* with regard to the phyſiology of our bodies; to wit, the VASCULAR SYSTEM, and the ABSORBENT SYSTEM, the BRAIN and NERVOUS SYSTEM having been long before known. Vide Dr. Hunter's Second Lecture.

SECT.

SECT. IX.

OF THE GASTRIC SOLVENT, AND THE RELATIVE DIGESTIBILITY OF FOOD.

In ſerpents, ſome birds, and ſeveral kinds of fiſh, which ſwallow whole animals, and retain them long in their ſtomach, *digeſtion* ſeems to be performed, ſays Chiſelden, by *ſonme unknown menſtruum*; for we frequently find in their ſtomachs animals ſo totally digeſted, *before their form is deſtroyed*, that their very *bones* are made *ſoft*. One may indeed draw very plauſible inferences concerning human digeſtion, from obſervation on other ſpecies of animals, eſpecially from birds of prey, the cat and dog, which reſemble us ſo much in the ſtructure of the ſtomach. But analogical arguments are *probable* indeed, but not *couclusive*. And it is an object of much higher importance to attain *certainty* in man than in animals. In the writings of ancient and modern phyſicians no topic is more frequently diſcuſſed, yet there is little elſe beſide *ſuppoſition*: direct experiments upon *man* are entirely wanting, and their reſearches are illuminated only by the *twilight* of conjecture, and ſupported by *precarious hypotheſis*. Upon reflection, ſays Spallanzani, it appeared that direct experiments might be made on man, and for this purpoſe it was neceſſary to ſwallow tubes full of various vegetable

and

and animal ſubſtances, in order clearly to aſcertain *the changes* they undergo in the ſtomach. I will candidly own, ſays he, that the experiment gave me at firſt ſome apprehenſion. The hiſtories of indigeſtible ſubſtances occaſioning troubleſeme ſymptoms, and being vomited up after a conſiderable time*, occurred to my imagination. I alſo recollected inſtances where ſuch bodies had ſtopped in the alimentary canal.

Dr. Coe, in his Treatiſe on Biliary Concretions, gives an inſtance of a woman, from whoſe rectum was extracted a concretion, the nucleus of which was a *plum ſtone.* In the Edinburgh Medical Eſſays, we have an account of a ſimilar fact. In the Eſſays and Obſervations, Phyſical and Literary, there is the hiſtory of a boy who had three ſtones extracted from the rectum, the nuclei of which were the ſmall bones of *ſheep's trotters.* In the Philoſophical Tranſactions, we have an account of a concretion formed upon a *plum-ſtone*, and retained in the blind gut: and in the London Medical Journal, Mr. Johnſon relates the caſe of a woman, who paſſed a ball of hardened fæces, weighing three quarters of an ounce, the nucleus of which was a *plum-ſtone.*

Other facts however, where the reſult was contrary, and of more frequent occurrence, gave me alſo ſome confidence. Thus we every day ſee the ſtones of cherries, medlars, plums, &c. ſwallowed and voided with impunity. This conſideration at laſt determined me to make the trial with as great caution as poſſible.

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* Vide Baron Haller, T. 6.

I ſwallowed, in the morning faſting, a linen bag, containing 52 grains of *maſticated bread.* I retained the purſe 23 hours without experiencing the ſmalleſt inconvenience, and then voided it quite *empty*. The ſtring uſed for ſewing and tying it was entire, nor was there any rent in the bag itſelf. The fortunate reſult of this experiment gave me great encouragement to undertake others.

From *vegetable* I proceeded to *animal* ſubſtances. In a ſimilar bag 60 grains of *boiled veal* were encloſed, previouſly maſticated. The purſe was voided in 18 hours and three quarters, and the fleſh was *conſumed*. Only a few fibres remained, and theſe were void of ſucculency, as if they had been ſet under a preſs.

My next experiments were made to ſee, whether digeſtion was accompliſhed or aided by a *triturating power* in the ſtomach.

Boerhaave, neither ſatisfied with the ſyſtem of digeſtion in the human ſtomach by heat, as ſuggeſted by Galen, and adopted by his followers; nor yet better pleaſed with attributing this proceſs to the vital energy of the ſoul reſiding in the ſtomach, as conceived by the fertile imagination of Van Helmont; invented a ſyſtem of his own, in which he attributes the digeſtion of our food partly to *fermentation*, but principally to *triture*, *preſſure*, and *powerful quaſſation.* He deſcribes the folds of the ſtomach as grinding the more ſolid parts of the aliment; and, to aſſiſt in this proceſs, he calls in the aid of its external coat, with the diaphragm, and the numerous muſcles of the abdomen. Not ſatisfied with theſe, he takes into his account the violent pulſations of the ſubjacent aorta, with the vibrations of innumerable ſurrounding arteries, which he eſtimates at no leſs than three thouſand ſix hundred pulſations in the hour.

This diſtinguiſhed phyſician reaſoned from analogy, and took particular notice of the *oſtrich*, which he had obſerved to ſwallow pieces of iron and of glaſs, evidently for the purpoſe of triture, becauſe the ſound of *grinding* was perceptible to thoſe who liſtened.

In the *granivorous birds* he had remarked, beſide the crop, furniſhed with ſalivary glands to mollify their food, a gizzard, or ſecond ſtomach, provided with ſtrong muſcles to *triturate* the grain; and the avidity with which they ſwallow gravel to aſſiſt the operation had not eſcaped his notice. Having examined the ſtructure of the *lobſter*, he ſaw at the mouth of the ſtomach a curious mechaniſm, *three teeth*, of which *one* moved by a ſtrong muſcle, *triturates* the food againſt *the other two.*

In the larger *crawfiſh* of the ſea, he might have noticed a ſtructure ſomewhat different, where to anſwer the ſame intentions, inſtead of *three teeth*, we obſerve a *peſtle* ſupplied with a ſtrong muſcle and placed between *two mortars.*

No wonder, then, that this great mechanic on the ſubject of digeſtion had mechanical ideas.

To prove that digeſtion in the human ſtomach is not performed by *triture*, I was under the neceſſity, ſays Spallanzani, of ſwallowing thin tubes. Theſe tubes were voided in about 22 hours. Among the tubes employed in theſe experiments I procured ſome to be made ſo *thin* that the ſlighteſt preſſure would have cruſhed them to pieces, or have bent in their *edges*; but though I frequently uſed them, *not one was ever broken*, nor on examination could I perceive the *ſmalleſt fiſſure*.

Having thus eſtabliſhed this fundamental propoſition, viz. *that digeſtion is produced by the gaſtric fluid independently of trituration*, I had before me, ſays he, a fine field for experiments, which could not fail to ſuggeſt ſome important truths.

The neceſſity of maſtication deſerves to be well known. There is, perhaps, no perſon who has not ſome time or other been ſubject to indigeſtion for want of having chewed ſufficiently his food. I took *two* pieces from a pigeon's heart, each weighing *forty-five* grains, and having *chewed one* as much as I uſed to chew my food, encloſed them in two ſpheres, and ſwallowed them at the ſame time. Both theſe tubes happened to be voided at the ſame time, and then I ſaw *how much digeſtion is promoted by maſtication*. Of the *maſticated fleſh* there *remained only* 4 *grains*, whereas of *the other* there were 18 *left*. This was confirmed by two other experiments, one made with *mutton*, the other with *veal*. The reaſon of this is obvious. Not to mention the ſaliva which moiſtens and attenuates the food, it cannot be doubted, that when it is reduced to pieces by the action of the teeth, the *gaſtric juice* meets it at all points, and therefore the more ſpeedily diſſolves it, juſt as other menſtrua diſſolve ſooneſt thoſe bodies that have been previouſly broken into fragments.

I now wiſhed to make ſome experiments with the gaſtric fluid *out of the body*. A ſufficient quantity could not be obtained by killing birds and other animals, and it became neceſſary to invent a contrivance for obtaining it from them alive. Three tubes containing *ſpunge* were therefore introduced into the ſtomach of a crow, and after four hours theſe were vomited up. The pieces of ſpunge being ſaturated with the fluids of that cavity, were then taken out and preſſed between the fingers. Theſe afforded 37 grains of *gaſtric liquor* of a tranſparent yellow colour, poſſeſſing a ſomewhat bitter and ſaltiſh taſte.

I now attempted, ſays the Abbé, to produce *artificial digeſtion* with the gaſtric juice thus obtained.

It was January, and Fahrenheit's thermometer, placed near the veſſel uſed for the experiment, ſtood at 42 and 43 degrees. For greater certainty in theſe experiments, I eſtabliſhed a term of compariſon, by employing ſimilar veſſels, containing the ſame fleſh, infuſed in water. I alſo took care, upon the preſent occaſion, that the fleſh ſhould be completely immerſed in their reſpective liquors, and that the phials ſhould be cloſed with ſtopples. *For ſeven days the fleſh kept in the gaſtric juice, and in water continued the ſame.* On the eighth I perceived, ſays Spallanzani, a ſlight ſolution, for upon agitating both liquors, ſeveral particles ſeparated from the larger maſs, and fell down to the bottom of the phials. No further progreſs was afterwards made, and the gaſtric fluid did not ſeem at all more efficacious than common water; only the fleſh immerſed in the former *in a ſurpriſing manner was preſerved from putrefaction.* In this experiment I had uſed beef; I verified the ſame obſervation upon the more tender fleſh of calves, chickens, and pigeons; the temperature of air was about 48 degrees of Fahrenheit's thermometer.—While I was making theſe experiments in the natural temperature of the air, I was employed about others of a like nature in a *warmer medium,* viz. in a ſtove, in which the heat varied from 79 degrees to 80 of heat. *And now the effects produced by the gaſtric fluid, greatly differed from thoſe produced by water*[*]. In the latter the fleſh began to be a little diſſolved in two days; this was the effect of incipient putrefaction from heat and moiſture. The *fœtid ſmell* continued to increaſe during the following day, and in a week became intolerable, when the fleſh was reduced to a nauſeous pulp. *In the gaſtric juice the ſolution was more rapid, and exhibited very different phænomena; twenty-five hours were ſufficient to decompoſe the fleſh contained in it, and in a little more than two days there remained only a very ſmall morſel entire.* Theſe ſolutions never emitted any *bad ſmell*; whence it is evident, that they did not ariſe from incipient putrefaction, like thoſe in water, but from a more efficacious and a different menſtruum, viz. the *gaſtric liquor.*

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[*] This ſhews how much digeſtion depends upon *animal heat*, and as this ariſes from the *oxygenation of the blood,* the relationſhips are concatenated. Vide Sect. X. *on the balance between digeſtion and the oxygenation of the blood.*

To Edinburgh there came by accident a huſſar, a man of weak underſtanding, who gained a miſerable livelihood by ſwallowing pebble-ſtones, and chewing flints*, for the amuſement of the common people. The ſtomach of the *ſtone-eater,* as he choſe to ſtyle himſelf, was ſo much diſtended, that he was able to ſwallow a great number of pebble-ſtones during the day; and theſe might be plainly felt, and be *chinked,* if you preſſed forcibly with your hand below the ſhort ribs on the left ſide.

Dr. Stevens tried many experiments ſimilar to thoſe above related, with this man, who ſwallowed ſilver ſpheres, which were perforated ſo fine as hardly to admit a needle into each opening, and he always found the food that he incloſed in theſe bodies diſſolved. He next turned his attention to the different degrees of *ſolubility*; or, as it was formerly called, to the *hard* or *eaſy digeſtion* of *different ſubſtances*, and the reſult of his experiments are equally curious as important.

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* His front teeth were *filed down,* and he had the art of ſplitting into pieces *flint ſtones,* by ſtriking them with his fore-teeth in a *particular direction,* juſt as they faſhion *flints* for guns. *Theſe pieces* he would ſhew to his aſtoniſhed viſitants, put them under his tongue, and pretending to have ſwallowed them, he would then proceed actually to gulp down ſome *ſmooth pebble-ſtones,* which he took care to have by him on the table.

Having procured a whelp five months old, it was kept faſting ſixteen hours, and four of the globes, as uſed in the foregoing experiments, each containing a like quantity of food, were forced into its ſtomach. The ſubſtances had been previouſly cooked, and weighed each 16 *grains*. Seven hours afterwards the animal was killed, and the globes were taken out of the ſtomach; when the *beef* was found to have loſt 10½ grains, the *mutton* 6 grains, the *potatoe* 5 grains, the *fowl* 4 grains, and the *parſnep* 0.

To another dog that had faſted twelve hours I gave, ſays he, 16 grains of *roaſted beef*, in a ſecond ſphere the ſame quantity of *veal*, in a third only *fat*, and in a fourth *wheaten bread*. In ten hours the animal was killed and opened, and the tubes were taken out of its ſtomach. The *beef* and *bread* were quite diſſolved; the *veal* had loſt only ten grains, and the *fat* 8½ grains.

As in the laſt experiment the *veal* was not ſo ſoon diſſolved as the *beef*, I began, ſays he, to ſuſpect that the fleſh of *young animals* in general is leſs eaſy to digeſt than *that of old ones.* I therefore took care to repeat the experiment with *lamb* and *mutton*, which were put in equal quantities into two tubes. The reſult was as before. In ſeven hours the *mutton* was *quite diſſolved,* whereas the *lamb* had loſt only 10 grains.

Having kept a dog faſting eighteen hours, that his ſtomach might be free from the remains of food, I killed it, and collected about half an ounce of pure gaſtric fluid, which was put in ſeparate phials. I then made trial of *mutton*, *veal*, *lamb*, *chicken*, and other *animal* and *vegetable ſubſtances*, and imitating the heat of the ſtomach, they were all readily diſſolved; but the time requiſite for the completion of this proceſs was different, and anſwered exactly *to the reſults of the preceding experiments* *.

Mr. Belcher happening to dine at a callico printer's, was ſurpriſed to find the bones of the pork at table of a very red appearance. They had eat *madder*. This eminent ſurgeon mixed that ſubſtance with different foods, and gave it to fowls, and other animals, and a ſimilar change of colour in all the bones, and even in the teeth, took place: but, after a certain time, if theſe were fed on food containing no *madder*, the bones *regained* their natural appearance. To prove that the different parts of the body are renewed, John Hunter fed two ducks, the one with *barley*, the other with *ſprats*, for about a month, and killed both at the ſame time. When they were dreſſed and ſerved at his table, that fed wholly with *ſprats* was *hardly eatable*, it *taſted ſo ſtrongly of fiſh*. Theſe facts prove, that our fabric is ever being pulled to pieces and renewed; that the matter is continually changed, though the ſame *identity* remains! They alſo prove that our body may be compoſed of parts *unaſſimilated*, though *changed* by the wonder-working powers of the body from *inanimate* to *animate matter!*

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* We are apt to imagine, that *hard* ſubſtances are more difficultly diſſolved than *ſoft*, but a little attention ſhews us that *the menſtruum* being adapted to the ſubject, *hardneſs has nothing to do in it: oil of vitriol* diſſolves *ſteel,* and yet does not touch *wax*, and *oil* diſſolves *wax,* and does not touch *iron*; and ſo in a thouſand inſtances. Nurſes call *lamb* harmleſs only from the nature of the animal. Dr. SHEBBEARE.

The *huſk* of the ſeeds of plants appears to be indigeſtible in its natural ſtate; whether this ariſes, ſays the celebrated John Hunter, from the *nature of the huſk* itſelf, or from its *compactneſs* *, I am not certain, but am inclined to *ſuppoſe the laſt*; as we find the *cocoa*, which is only a huſk, to be digeſtible, when ground to a powder and well boiled. We know, likewiſe, that cuticle, horn, and bone, although animal ſubſtances, are not affected, in the firſt inſtance, by the gaſtric juice; yet if reduced in Papin's digeſter * to a jelly, that jelly can be acted upon in the ſtomach; we muſt therefore ſuppoſe that a certain natural degree of ſolidity in animal and vegetable ſubſtances render them indigeſtible. This compactneſs in the huſk ſeems to be intended to preſerve, while under ground, the farinaceous part of the ſeed, in which the living principle is placed; the huſk having probably no other power of reſiſting putrefaction than what ariſes from its texture. Of twenty-five ripe grapes, which Spalanzani ſwallowed, by way of experiment, eighteen were voided *entire*, of the other ſeven the *ſkins* only appeared. He made the ſame experiments with cherries, and currants, as well ripe as unripe, and by far the greater number were voided *entire*. Although moſt huſks are not capable of being diſſolved in the gaſtric juice, they generally allow of tranſudation; and that the ſeed is in ſome degree affected, is known by its ſwelling in the ſtomach; yet it can only admit by that means a certain portion of the gaſtric juice, and that not ſufficient to convert it into chyle; therefore we ſee grain when ſwallowed whole, unleſs in birds, whoſe gizzards ſerve them as our teeth, to grind or divide the grain, paſs entire, though much ſwelled; and even the kernels of ſome nuts, as *Spaniſh cheſnuts*, are not digeſtible when eaten raw.

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* This doubt, the author of the preſent work would have anſwered himſelf by experiment, but having felt the tortures of pain, he could not bear to inflict death on any animal incapable of doing him an injury from its nature, unleſs where the importance of the ſubject had juſtified, or rather had demanded, the cruelty.

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* The advantage of Papin's digeſter is to give *boiling water* a greater heat than it is capable of naturally having. To do this, the vapour muſt not be ſuffered to eſcape. The lid is ſo contrived as to open inwards, that the ſteam may not force its way out. There is a ſtopple, however, on the lid, to which is fixed the arm of a lever, ſuſpended on a balance. Weights are applied at the end neareſt the ſtopple. Now when the water within is ſo very much heated, that the ſteam *will* force open the ſtopple, and ſo raiſe up the arm of the lever; by knowing what weight is ſuſpended, we can determine exactly the degree of heat. Vide what was before ſaid on the cooling effects of *evaporation*, or the quantity of *caloric* that eſcapes when water is *aerialized* or converted into *ſteam*.

But not only *very compact ſubſtances* are difficult of digeſtion, but alſo thoſe that are *fluid* are ſo likewiſe: and we may obſerve, that nature has given us very few fluids as articles of food, and to render the few fitter for the digeſtive powers, a *coagulating principle* is provided to give them ſome degree of ſolidity*.

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* All milk turns in the ſtomach into curds and whey. The property of calves *rennet* is well known. When too much *acidity* prevails in the ſtomach, a little *magneſia* corrects it, and prevents the curd from being *too hard*, and conſequently difficult of digeſtion. It is often proper to dilute milk, in order that the *coagula* may be broken into very ſmall fragments.

SECT. X.

ON THE BALANCE BETWIXT DIGESTION AND THE OXYGENATION OF THE BLOOD.

IT is impoſſible, ſays the author of the *Medical Spectator*, indeed, to peruſe the following extract from a late publication of Dr. Beddoes without feeling the warmeſt approbation, and the moſt anxious deſire to co-operate with him and Drs. Darwin, Ewart, Thornton, and thoſe other phyſicians whoſe letters he has publiſhed, in their laudable attempts to render the PNEUMATIC CHEMISTRY *uſeful to mankind.*—Theſe, I am well perſuaded, muſt be the ſentiments of *every medical man, who poſſeſſes a ray of true ſcience*; and *to me*, it is particularly pleaſing, becauſe I alſo have many years ago entertained an opinion nearly ſimilar. "A firm perſuaſion," ſays Dr. Beddoes, "had long ſettled on my mind, *that* "*the ſyſtem might be as powerfully and as variouſly* "*affected by means of the lungs as of the ſtomach. And* "*the more knowledge we have acquired of the proper-* "*ties of elaſtic fluids, the more has this my opinion been* "*confirmed. Of all the functions,* RESPIRATION *is, I* "*think, the beſt underſtood*; *and it will alſo be found in* "*philoſophic and cautious hands to be the moſt eaſily* "*managed. It is impoſſible,*" adds Dr. Beddoes, "*now* "*to doubt, that we are nouriſhed by the lungs as truly,*

" *as by the ſtomach; and that what we take in at the for-* " *mer entrance becomes, like our food, a part of the ſub-* " *ſtance of our ſolids as well as our fluids.—By the lungs* " *we can alſo introduce effectual alteratives of the blood,* " *and by conſequence act on all the parts nouriſhed by the* " *blood. For ſome time,*" adds this illuſtrious philoſopher, " *I breathed oxygen air, with a certain portion of* " *atmoſpheric air, and I felt at the time of inſpiration, that* " *agreeable glow and lightneſs of the cheſt, which has* " *been deſcribed by Dr. Prieſtley and others. In a very* " *ſhort time I perceived a genial warmth, and a greater* " *flow of ſpirits than uſual, and by degrees my complexion* " *from an uniform brown became fairer and ſomewhat* " *florid; I perceived alſo a carnation tint at the ends of* " *my fingers, and my lips became of a bright red. I* " *even think it probable that* OXYGEN, *or* VITAL " AIR, *which, by uniting with the blood, creates ſuch a* " *beautiful colour to the complexion, may ſuperſede all* " *other coſmetics; one deciſive advantage it will cer-* " *tainly have over them all, for while it improves the* " *looks, it will, if rightly adminiſtered, amend the health* " *alſo**." This experiment points out, in the ſtrongeſt point of view, that *oxygen* or *vital air*, by blending with the *blood*, becomes one of the CONSTITUENT PRINCIPLES of the body.

I have had, ſays the celebrated Spaniſh traveller the Rev. Mr. Townſend, frequent opportunities of remarking a beautiful balance betwixt RESPIRATION and DIGESTION.

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* From Dr. Beddoes's Letter to Dr. Darwin on the New Method of curing Pulmonary Diſorders.

During a putrid fever which attacked him laſt ſummer, it was too evident to eſcape the obſervation even of his *nurſes*. *When the ſtomach was oppreſſed, reſpiration laboured; and when the lungs were plentifully ſupplied with vital air, the breathing became eaſy, and the ſuperabundant quantity of food was no longer a burthen.*

Mr. Townſend's words are*, "whenever the air "of my bed-chamber was artificially *oxygenated*, as "my phyſician Dr. Thornton often witneſſed, *my "reſpiration was pleaſant, my oppreſſion at my cheſt "relieved, and I was enabled to breathe freely through "the noſtrils without the aſſiſtance of my mouth, which I "could not do before the room was oxygenated.* At the "ſame time I am convinced *that my appetite was "greatly increaſed, and my digeſtion conſiderably quick-"ened.*"

The celebrated Dr. Ingenhouſz obſerves, that the air at Vienna contains more OXYGEN than in the low country of Holland; *hence the increaſe of appetite of thoſe who go from Holland to Vienna, and the reverſe effect with travellers to Holland.*

When Dr. Beddoes inhaled the *vital air*, his appetite was ſo far increaſed, that he ſays, "that al-"though before he could eat only a certain quantity "and was full, he now eat double that quantity, "and yet did not feel himſelf ſatiated."

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* Vide *the Guide to Health.*

Every one muſt have experienced the difference of appetite after walking in a clear air, or when ſtaying at home.

Certain foods increaſe the attractive power of blood for *oxygen.* Dr. Withering, writing to Dr. Beddoes, ſays, the experiments you wiſh for have been in part made. The late ingenious Mr. Spalding, who did ſo much in improving and uſing the diving-bell, and had practiſed with the greateſt ſucceſs for many years, was a man of nice obſervation, and had he not fallen a ſacrifice to the negligence of drunken attendants*, would have thrown much additional light upon more than one branch of ſcience. He particularly informed me, "*that when he had eaten animal food, or* "*drank fermented liquors, he conſumed the air in the* "*bell much faſter than when he lived upon vegetable food* "*and drank only water.*" Many repeated trials had

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[*] Mr. Spalding twice went down, accompanied by a young man, who was educated by him, to view the wreck of the Imperial Eaſt Indiaman on the coaſt of Ireland. On deſcending the third time, in June 1783, they remained above an hour under water, and had barrels of air ſent down to them, but not ſufficient for their wants, probably from the drunkenneſs of their attendants, hence they were both found dead in the bell. This unhappy event, ſays the celebrated Dr. Darwin, may for a time check the ardour of adventurers in traverſing the bottom of the ocean, but it is probable in another half century it may be as ſafe to travel *under* the ocean, as *over* it, ſince Dr. Prieſtley's diſcovery of procuring *vital air* in the greateſt abundance from the calces of metals, as well as nitre.

ſo convinced him of this, that he conſtantly abſtained from the *former diet* whilſt engaged in diving.

We now ſee the reaſon why men who are oppreſſed with food, more eſpecially animal food, *pant*; and why in a cloſe room, where they are confined within the curtains of a bed, where the air is vitiated by paſſing frequently through their lungs, they open their mouths wide to breathe, and therefore why they *ſnore*.

I have often had opportunity to converſe with miners in Cornwall, Mr. Townſend relates, who had been almoſt deprived of life by breathing a mephitic air, and have been informed by them, that on reviving they have conſtantly been ſeized with *nauſea*, and that commonly the ſtomach has rejected its contents quite *crude*.

Whenever the imperfect tribe of animals, or ſuch as ſleep out the winter, are expoſed to a cold ſo great as, in a great meaſure, to rob them of their *inbred heat*, their powers of *motion* are proportionably diminiſhed, and as they cannot have, at that ſeaſon, a very copious generation of caloric, but only enough to keep up the ſpark of life (their animal oil, which is compoſed of principles attractive of *oxygen*, being ſufficient for that purpoſe), they loſe all the power of *digeſtion*.

At Belliſle, in the beginning of the winter 1761, I conveyed, ſays John Hunter, worms, and pieces of meat, down the throats of lizards when they were going into winter quarters, keeping them afterwards

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in a cool place. On opening them at different periods, I always found the ſubſtances which I had introduced entire, and without *any the leaſt alteration.*

A hedge-hog, while the heat of the body was at 30 degrees, had neither *deſire for food* nor power of *digeſting it*; but when by artificial means it was increaſed to 93 degrees, the animal ſeized a toad which happened to be in the room; and upon being offered ſome bread and milk, it immediately eat it. The heat rouſed up the actions of the animal œconomy; the breathing became quickened; and the blood, having imbibed a greater quantity of OXYGEN AIR, containing latent fire, to be extricated by the principles ſeparated by the ſtomach; hence the immediate call on the *digeſtive powers* of that organ.

PRACTICAL OBSERVATIONS.

SECTION XI.

I. OF THE FOOD PROPER FOR CHILDREN.

NATURE not only points out the food fit for infancy, but alſo kindly prepares it. When the babe, ſoon after it is born in this *cold* world, is applied to its mother's boſom, its ſenſe of perceiving *warmth* is firſt agreeably affected; next its ſenſe of *ſmell** is delighted with the odour of the milk; then its

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* Any one may obſerve this, when very young infants are about to ſuck; for at thoſe early periods of life, the perfume of the milk affects the organ of ſmell, much more powerfully than after the repeated habits of ſmelling has inured it to odours of common ſtrength, and the lacrymal ſack empties itſelf into the noſtrils, and an increaſe of tears is poured into the eyes. And in our adult years, the ſtronger ſmells, though they are at the ſame time agreeable to us, as of volatile ſpirits, continue to produce an increaſed ſecretion of tears. Dr. DARWIN.

A calf diſcovers its mother by its ſenſe of ſmell; and each pig has its peculiar teat to which it always goes. What is very remarkable, when a lamb dies, to make the ewe take to another lamb, it muſt be covered for a few days with the fleece of the dead one.

taſte is gratified by the flavour of it; afterwards the appetites of *hunger* and of *thirſt* afford pleaſure by the poſſeſſion of their objects, and by the ſubſequent digeſtion of the aliment; and laſtly, the ſenſe of *touch* is delighted by the ſoftneſs and ſmoothneſs of the milky fountain, which the innocent embraces with its hands, preſſes with its lips, and watches with its eyes. Satisfied, it ſmiles at the enjoyment of ſuch a variety of pleaſures. It feels an animal attraction, which is love; a ſenſation, when the object is preſent, a deſire, when it is abſent; which conſtitutes the pureſt ſource of human felicity, the cordial drop in the otherwiſe vapid cup of life, and which overpays the fond mother for all her ſolicitudes and care.

It appears from the annual regiſters of the dead, that almoſt one half of the children born in Great Britain of great families die in their infancy. To many, indeed, this may appear a natural evil; but on due examination, it will be found to be one of our own creating. Were the deaths of infants a natural evil, other animals would be as liable to die young as man, but this, we find, is by no means the caſe.

A mother who abandons the fruit of her womb, as ſoon as it is born, to the ſole care of a hireling, hardly deſerves that tender appellation. Nothing can be ſo prepoſterous as a mother who thinks it below her to take care of her own child. If we ſearch nature throughout, we cannot find a parallel to this. Every other animal is the nurſe of its own

offspring,

offspring, and they thrive accordingly.* Were the brutes to bring up their young by *proxy*, they would ſhare the ſame fate with thoſe of the human ſpecies.

Connubial fair! whom no fond tranſport warms
To lull your infant in maternal arms;
Who, bleſs'd in vain with tumid boſom, hear
His tender wailing with unfeeling ear;
The ſoothing kiſs and milky rill deny
To the ſweet pouting lip, and gliſtening eye!—
Ah! what avails the cradle's damaſk roof,
The eider bolſter, and embroider'd woof!—
Oft hears the gilded coach, unpity'd 'plains,
And many a tear the taſſel'd cuſhion ſtains!
No voice ſo ſweet attunes *his cares* to reſt,
So ſoft no pillow, as his *mother's* breaſt!—

Dr. DARWIN.

A child, ſoon after the birth, ſhews an inclination to ſuck; and there is no reaſon why it ſhould not be gratified. It is true, the mother's milk does not always come immediately after the birth; but this is the way to bring it *: beſides, the *firſt milk* that

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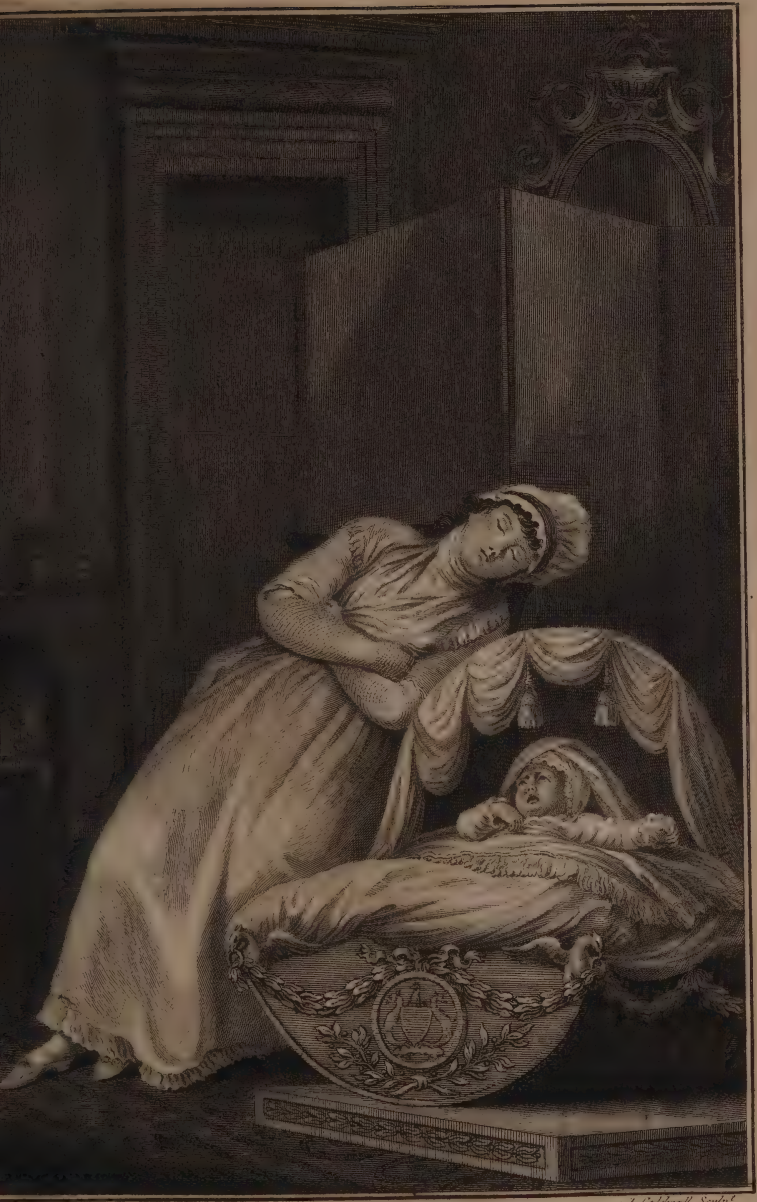
* Dr. Armſtrong, Phyſician to the Britiſh Lying-in Hoſpital, in this particular, ſeconds the advice given to mothers by the benevolent Dr. Buchan. An infant, ſays he, although for ſome time it has no great need for food; yet doubtleſs ought to be laid to the breaſt, as ſoon as the mother may, by ſleep, or otherwiſe, be ſufficiently refreſhed to undergo the little fatigue that an attempt to ſuckle may occaſion. This method, however



C.R.Ryley Delᵗ. *J. Caldwall Sculpᵗ.*

A HIRELING.

that the child can ſqueeze out of the breaſt anſwers the purpoſe of *cleanſing*, better than all the drugs in the apothecary's ſhop, and at the ſame time prevents inflammations of the breaſt, fevers, and other dangerous diſeaſes, from the ſuppreſſion of this natural ſecretion. It is ſtrange how people came to think that the firſt thing given to a child ſhould be *drugs.* This is beginning with medicine by times, and no wonder that they generally end with it. It ſometimes happens, indeed, that a child does not diſcharge the *meconium* ſo ſoon as might be wiſhed; this has induced phyſicians, in ſuch caſes, to give ſomething of an opening nature to cleanſe the firſt paſſages. Midwives have improved upon this hint, and never fail to give ſyrups, oils, &c. &c. whether they be neceſſary or not. Cramming an infant with ſuch *indigeſtible ſtuff*, as ſoon as it is born, can hardly fail to make it ſick, and bring on a real occaſion for medicines.

Almoſt as ſoon as the babe is born the *officious*

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however unuſual with ſome, is moſt agreeable to nature. By means of putting the child *early* to the breaſt, eſpecially the firſt time of ſuckling, the nipple will be formed, and the milk gradually brought on. Hence much pain, and its conſequences, will be prevented, as well as the frequency of ſore nipples, which, in a firſt lying in, have been wont to occaſion no ſmall inconvenience. To teach the child how to ſuck, a little milk and water, ſweetened with white ſugar, may be given it at the end of a tea-ſpoon, which the innocent will claſp in its mouth; or a finger wetted with it may be frequently put between its gums.

nurſe, knowing what is comfortable to herſelf, imagines that what is good for her, and her miſtreſs, cannot be bad for the poor infant. This naturally ſuggeſts the idea of cordials. Accordingly wine is univerſally mixed by nurſes with the firſt food of children, or Dalby's carminative is adminiſtered. Nothing can be more fallacious than this mode of reaſoning, or more hurtful than the conduct founded on it. Children need very little food for ſome time after their birth, and what they receive ſhould be light and of a cooling quality; a ſmall quantity of *wine* hurries on the *reſpiration*, and conſequently the *circulation*, which nature for wiſe purpoſes has made already very *rapid**.

If the mother or the nurſe has enough of *milk*, the child will need no other food. Milk itſelf is produced from food taken in by the mother. It is in her ſtomach that the aliment is diſſolved, or digeſted, which by a combination of powers in the *chylopoiectic viſcera*, or parts preparing the chyle, is ſo far animalized † as to be converted into a kind of

white

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* In a *new born infant* the pulſe is about 134 in a minute, in *middle age* from 60 to 80, and in *extreme old age* from 50 to 24. Dr. ADAIR.

† We may obſerve the hen hunting after *worms* and *little inſects* for its young; and poulterers follow without the bias of theory the ſame method of rearing them. Reaumur gave ſeveral ducks, the one *animal*, and the other *vegetable* food, and having killed them, he found the animal ſubſtances *always* ſooner digeſted than the grain. Thus then it ſeems, that

ANIMAL

white blood. Hence it is very apparent, that previous to an infant having acquired ſtrength enough to convert ſolid food into bland and wholeſome chyle, and while the fibres of the ſtomach and inteſtines are peculiarly *irritable*, the parent, by a wiſe ſubſtitution in nature, has previouſly accompliſhed this work for the infant ſhe is about to nouriſh.

After the ſecond or third month, it may then be proper to give the child, once or twice a day, a little of ſome other food *. This will eaſe the mother, will accuſtom the child by degrees to take food, and will render after-weaning both leſs difficult and leſs dangerous. Nature abhors all ſudden tranſitions. For this purpoſe, the food of children ought not only to be ſimple, but to reſemble, as nearly as poſſible, the properties of milk. Indeed *milk* ſhould make a principal part of their food, not only before they are weaned, but for a long time after.

Bread may be given to a child as ſoon as it ſhews an inclination to chew. The very chewing of bread will promote the cutting of the teeth, and the

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ANIMAL FOOD is much eaſier digeſted and tranſmuted in children into *animal ſubſtance*, by the powers of digeſtion, than the vegetable; and this plainly appears, if you begin from the firſt moment of the fœtus increaſing in the womb, where, till its coming into light, it is formed entirely of animal ſubſtance.

* As *ſoft biſcuit* or *cruſt of bread*, which are eaſier digeſted than *crumb*, with *milk* and *water*.

diſcharge of ſaliva. Children diſcover an early inclination to chew whatever is put into their hands. Parents obſerve the *inclination*, but know not how to apply the *remedy*. Inſtead of giving to the child ſomething which may at once exerciſe its gums and afford it nouriſhment, they commonly put into its hands a piece of hard metal, or impenetrable coral. A cruſt of bread, or a piece of ſtick liquorice, is the beſt *ſuck-thumb*. It not only anſwers the purpoſe better than any thing elſe, but has the additional properties of nouriſhing the child, and carrying the ſaliva down the ſtomach, which is a great promoter of digeſtion.

It is ſoon enough to allow children *animal food*, when they have got teeth to tear it. Then we ſhould remember that their pulſe is uſually at 130, and from the obſervation of Mr. Townſend and others, the pulſe is quickened by *animal food*, and the ſame is not obſerved, when we have been eating only *vegetables* *. We ſhould then employ a plentiful mixture of vegetable with their animal food, which, as the proper food of manhood, the formation of his *teeth* † naturally points out to the phyſiologiſts,

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* Vide *the Guide to Health*, page 27.

† He has the *canine* or tearing teeth, the *inciſors* or clippers, and the *grinders*. Thoſe animals that have *only* the *canine teeth*, as the lion, &c. have a *gaſtric juice* that does not diſſolve *vegetables*; and on the reverſe, thoſe that have only the *inciſors* and *grinders*, as the horſe, &c. have a *gaſtric juice* that *only* diſſolves *vegetable ſubſtances*.

logiſts, and the experience of ages has proved to be the moſt conducive to health *. As the ſtomachs of children cannot bear repletion, becauſe of their temperament, and as they require food not only to keep up the parts already formed, but alſo to make an addition to them, they ought therefore to have *ſlender* but *frequent* meals, and this in proportion to their tender age.

II. OF THE FOOD PROPER FOR MANHOOD.

It is an ancient and approved maxim, that a life guided entirely according to the directions of art, muſt be a miſerable one; and the moſt judicious practitioners, ſenſible of the juſtneſs of the obſervation, and that what is prohibited is often the more eagerly coveted, have endeavoured, even to perſons labouring under diſeaſe, to give as great latitude as poſſible in the articles of diet, and to reconcile every part of the regimen they preſcribe, as nearly as they can, to the common mode of living, in order that the patient may be reminded as little as poſſible of his misfortune. Our directions therefore ſhall not be frivolouſly minute, but as ſhort as poſſible on this ſubject.

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* *Poverty*, ſays the celebrated Adam Smith, though it no doubt diſcourages, does not always prevent marriage. It ſeems even to be *favourable* to *generation*. A half-ſtarved highland woman frequently bears more than *twenty children*, while a pampered fine lady is incapable of bearing any, and is generally exhauſted by two or three. But *poverty*, though it quickens the powers of generation, is alſo extremely *unfavourable* to the *rearing* of children. *The tender plant is produced in ſo cold a ſoil, that it ſoon withers and dies. It is not uncommon in the highlands of Scotland, for a mother who has born* TWENTY *children to have but* TWO *alive.*

In the firſt place we ought carefully to *chew* our food, otherwiſe we ſhall impoſe much unneceſſary labour on the ſtomach, and retard digeſtion.

With reſpect to *quantity*, it is evident that this muſt be regulated by our feelings. A healthy man cannot be ſaid to exceed in the quantity of his meal, if he finiſhes it with a reliſh for more; if, immediately after eating, he can, if required, follow any employment, that does not demand ſtrong exerciſe or violent exertions; which to perſons in eaſy circumſtances will rarely be neceſſary, and ought in general to be avoided, as it diſturbs digeſtion*; though daily practiſed, from neceſſity, by the labouring poor †.

Gluttony is ſo ungentlemanlike a vice, that it would be an affront to ſuppoſe that perſons of poliſhed manners, who are the perſons who will probably read this book, could be capable of it. I ſhall therefore forbear to mention the innumerable train of evils that in time is certain to attend this beaſtly practice.

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* Dr. Adair.

† This has been before very *ſeriouſly* adverted to, and it is hoped that it will finally have its *due weight*, the conduct of maſters being here (like the traffic in human fleſh) both *cruel* and *impolitic*. Dr. Harwood, the Profeſſor of Anatomy at Cambridge, took two pointers equally hungry, and equally well fed; the *one* he ſuffered to lie *quiet* after his meal, the *other* he kept for above two hours in *conſtant exerciſe*. On returning

With reſpect to the *proper times* for eating, firſt,

OF BREAKFAST.

As our anceſtors breakfaſted early, they dined alſo early, and had at leaſt two meals after this, as appears from the allowance appointed for a *Lady Lucy*, who ſeems to have been one of the maids of honour in the court of Henry the VIIIth. I may be allowed to mention their articles of food, as a matter of curioſity, to ſhew in what manner the *fine ladies* lived in thoſe days.

This lady was allowed for BREAKFAST,

a chine of beef,
a loaf, and
a gallon of ale.

We have an account alſo of the BREAKFAST of an *earl* and *counteſs* in the lent ſeaſon, viz.

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turning home he had them both killed. *In the ſtomach of the dog that was quiet and aſleep, all the food was digeſted; but in the ſtomach of the other dog that proceſs was ſcarcely begun.*

a loaf of bread,
2 *manchettes* (which ſeem to have been loaves of a coarſer bread),
a quart of beer,
a quart of wine,
2 *pieces of ſalt fiſh,*
6 *baconed herrings,*
4 *white herrings,* and
a diſh of ſprats.

With reſpect to the *quality* of our different meals, we ſeem to depart more from the cuſtom of our hardy anceſtors with regard to *breakfaſt*, than any other meal. The contraſt at firſt ſight appears truly ridiculous. *A maid of honour* in the court of Queen Elizabeth, breakfaſted upon *beef*, and drank *ale* after it; whilſt the *ſportſman*, and even the *day-labourer*, now breakfaſt upon *tea*.

The philoſopher here humbly attempts to vindicate the preſent race; he believes that *ſleep*, which hereafter will be fully conſidered*, *accumulates* the irritability of the fibre, diſpoſing it to be more readily affected by ſtimuli of all kinds, hence the violent effects of all cordials taken in the morning, and hence perhaps the propriety of the gently ſtimulating power of coffee or bohea tea†. He would alſo recommend here *bread* moulded into ſuch ſhapes as to produce a great deal of cruſt*, and he would recal the reader, who reckons health as the firſt bleſſing, and as the means of enjoying and heightening all other bleſſings, to reflect on the utility of the *ſaliva*, and to remember that bread when buttered abſorbs little or no ſaliva, while a pound of dry bread carries down with it the ſame weight of this neceſſary moiſture†. We would here, therefore, only caution the reader againſt taking his tea *too hot*, and if he has been engaged throughout

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* Vide Law III. *on the Accumulation of Excitability.*

† TEA, whether *green* or *bohea*, is thought to be, though I doubt it, the produce of the *ſame* plant, the *green tea* being the ſhoots and earlier leaves, and *bohea* thoſe more *advanced* and *expanded*

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expanded. Like other ſtimuli, *green tea* made very ſtrong is an *emetic*, or occaſions *tremors*; if moderately ſtrong it *agreeably refreſhes* after a fatiguing journey, and from its excitement is productive of *wakefulneſs* to habits unaccuſtomed to *that ſtimulus*. GREEN TEA is ſuited *only* to *old age*, and *cold unirritable habits*.

[*] We ſaw before that *ſolid ſubſtances* are eaſier acted upon than *glutinous*. Thus *hot water* ſooner diſſolves *white ſugar* than *ſoft gum*, and *aqua fortis* corrodes copper, though it does not touch *wax*. It is leſs ſubject to *aceſcency*, and does not ſwell in the ſtomach.

[†] Pieces of meat, that may happen to get between the teeth, are *diſſolved* by this menſtruum, or at any rate are ſo *ſoftened*, and *their texture broken*, that this inconvenience is ſpeedily removed. If not a fluid, poſſeſſing properties the ſame as the *gaſtric fluid*, it muſt be allowed, certainly, that it *greatly aids that ſolvent*. If this penance be too great for the middle period of life, and muffins and crumplets ſoaking in butter muſt be indulged in, *children*, however, may be prohibited *butter*, and be made to have *good conſtitutions*, by which the contagion of *bad example* will afterwards be leſs ſeverely felt.

the preceding day, or that morning, in much exerciſe, to join with this neceſſary meal one or two ſoft *boiled eggs*[*].

OF DINNER.

The *ſame lady* who had *ſo ſolid a breakfaſt*, had for DINNER,

a piece of boiled beef,
a ſlice of roaſted meat, and
a gallon of ale.

IN THE AFTERNOON,

a manchette, and
half a gallon of ale.

FOR SUPPER,

a meſs of porridge,
a piece of mutton,
a cheat (or finer loaf),
and a gallon of ale.

To be ſociable after ſupper, there was left on the table,

a manchette loaf,
a gallon of ale, and
half a gallon of wine.

This lady had therefore four *heavy meals*. Inſtead of this we are led to recommend the modern practice of late dinners.—But becauſe long faſting is

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[*] This cuſtom univerſally prevails in *Ireland*, and is better than *hung-beef* and *achovies*, which accompany the *Scotch* breakfaſt.

injurious, and when very hungry we may be induced to eat more at this principal meal than can be properly digeſted, we would recommend *cold meats or ſoups* by way of COLLATION.

For dinner we would adviſe thoſe, who have a due ſenſe of the importance of health, to keep as much as poſſible to *one diſh.* To prefer MUTTON[*] to lamb, LAMB to *chicken* or *veal*, and BEEF, if tender, to either of the *three* laſt, and as *fiſh* is ſoon digeſted, to unite ſome *fleſh meat* with it, and to add to theſe *vegetables*. Could I believe I ſhould be liſtened to with indulgence, and not incur the general cenſure of prejudice, having nothing but *philanthropy* and the *improvement of ſcience* for my object, I would condemn, for convaleſcent and weak perſons, thoſe heterogeneous combinations called *puddings*[†], and am inclined to condemn alſo, though not the fruit, yet the *cruſt* of *all pies*. Let my readers here call to mind, that eggs and milk are both reckoned wholeſome *ſeparate*, but when combined, form a compound ſuited only for *ſtrong ſtomachs*.

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[*] When Sanctorius eat MUTTON, which was a food peculiarly grateful to his ſtomach, his *feelings* were *pleaſant*, and his *perſpiration* was *copious*;—when he eat *pork*, *gooſe*, *duck*, *muſhrooms*, or *melons*, he was *heavy* and *oppreſſed*; and found by the balance, that *his perſpiration diminiſhed one half*. This proves that even the *perſpiratory diſcharge* is very much under the influence of the STOMACH.

[†] Very few exceptions to this rule. The plaineſt puddings are generally very *compound*.

The art of cookery I am inclined to compare with the diabolical art of *undermining a town.* We all avoid the *red poiſon berries*, and caution others againſt them, though we give our FRIENDS *poiſoned pickles, and preſerves made in copper ſaucepans*, &c. and hold out ſuch temptations to *over-gorging*, which weak minds cannot reſiſt.

——————————They dine
With diſhes tortur'd from their native taſte,
And mad variety, to ſpur beyond
Its wiſer will the jaded appetite!
Is this for pleaſure?—Learn a juſter taſte;
And know, that TEMPERANCE is TRUE LUXURY.
Or is it pride?—Purſue ſome nobler aim.
Diſmiſs your paraſites, who praiſe for hire;
And earn the fair eſteem of honeſt men,
Whoſe praiſe is fame. Formed of ſuch clay as yours,
The ſick, the needy, ſhiver at your gates.
Even modeſt want may bleſs your hand unſeen,
Though huſh'd in patient wretchedneſs at home.
Is there no virgin, graced with every charm
But that which binds the mercenary vow?
No youth of genius, whoſe neglected worth
Unfoſter'd ſickens in the barren ſhade?
No worthy man, by fortune's random blows,
Or by a heart too generous and humane,
Conſtrain'd to leave his happy natal ſeat?
There are, while human miſeries abound,
A thouſand ways to waſte ſuperfluous wealth.

ARMSTRONG.

OF DRINKING AFTER MEALS.

A foreigner was invited to a party conſiſting as, he was told, of *Engliſh philoſophers*, of whom he conceived a great deal. After a very plenteous dinner the cloth was cleared, and the bottles were placed on the table. He was preſſed after five glaſſes to drink on; but the ſtranger perſiſted in aſſuring the company "*he felt no drought*." Theſe *philoſophers* began then to be *angry*, and the foreigner rang the bell, and *inſiſted* on another courſe, for *they* ought as much to *eat* againſt reaſon and inclination, as *he* had to *drink*.

I would here recommend the excellent ſaying, *a glaſs* for *digeſtion*, *another* for *my relations*, a *third* for *my king*, a *fourth* for *my country*, and if a *fifth*, it muſt be for *my enemy*.

It will not, I think, admit of a doubt, that *beer* or *water* is the only drink neceſſary in *early youth*; and that *wine*, and *ſpirituous liquors*, of which luxury has introduced a variety, ought to be appropriated ſolely to the *middle period*, to the comfort of *invalids*, and the invigoration of *old age*.

The great objection, however, againſt *geneva* and *water*, and *brandy* and *water*, is, that *invalids* are very apt to increaſe the proportion of the ſpirit ordered, and the great Dr. Fothergill, who was among the firſt who gave ſanction to this practice, declared, ſome time before his death, that he repented of having done ſo, from the *unfortunate habit* that had *ſtole* on ſome of his patients.

On pleaſure's flowery brink we idly ſtray,
Maſters as *yet* of our returning way.
Seeing no danger—we diſarm our mind,
And give our conduct to the waves and wind.
Then in the flowery mead, or verdant ſhade,
To wanton dalliance negligently laid,
We weave the chaplet, and we crown the bowl,
And ſmiling ſee the *nearer waters* roll,
Till the *ſtrong guſt* of *raging paſſions* riſe,
Till the dire tempeſt mingles earth and ſkies,
And ſwift into the boundleſs ocean borne,
Our *fooliſh confidence* too late we mourn;
Round our devoted heads the billows beat,
And from our troubled view the leſſening lands retreat.

Spirits, ſays the Abbé Raynal, were the gift the moſt fatal the old world ever made to the new. It was ſoon obſerved, that it diſturbed their domeſtic peace, deprived them of their judgment, and made them furious. In vain did ſome Frenchmen expoſtulate with them, and endeavour to make them aſhamed of *theſe exceſſes*. "*It is you*," anſwered they, "*who have taught us to drink this liquor, and* "*we cannot do without it. You have done the miſ-* "*chief, and it admits of no remedy.*"

To the credit of the preſent age, *hard drinking* is rarely practiſed by perſons of liberal education;

though, from the habit of ſitting at table ſome hours after dinner, we are tempted to *exceed* in the quantity of wine; which even with perſons in health too frequently deſtroys, in time, the tone of the ſtomach.

Were the pleaſure of the palate laſting, ſays Cornaro, *there would be ſome excuſe for inebriety, but it is ſo tranſitory, that there is ſcarce any diſtinguiſhing between the beginning and the ending; whereas the diſeaſes it produces are very durable.* This fact is well known in the diſtilleries, where the *ſwine* which are fattened by the ſpirituous ſediments of barrels, all acquire *diſeaſed livers.*

Mark what happens to that man who drinks a quart of wine or of ale, if he has not been habituated to ſo violent and exhauſting a ſtimulus. He loſes the uſe both of his limbs and of his underſtanding! He becomes a temporary idiot, and has a temporary ſtroke of the palſy! And though he ſlowly recovers after ſome hours, is it not reaſonable to conclude, that a frequent repetition of ſo powerful a poiſon muſt at length permanently affect him?—If a perſon accidentally becomes intoxicated by eating a few muſhrooms of a peculiar kind, a general alarm is excited, and he is ſaid to be poiſoned; but ſo familiarized are we to the intoxication from vinous ſpirits, that it occaſions merriment rather than alarm.

The ſtory of Prometheus ſeems to have been invented by phyſicians in thoſe ancient times, when all things were clothed in hieroglyphic, or in fable. Prometheus was painted as ſtealing *fire* from heaven, which might well repreſent the inflammable ſpirit produced by fermentation; which may be ſaid to animate or enliven the *man of clay*: whence the conqueſt of Bacchus, and heedleſs mirth and noiſe of his devotees.—*But the after punishment of thoſe, who ſteal this accurſed fire, is a vulture gnawing the liver; which well allegorizes the poor inebriate lingering for years under painful hepatic diſeaſes**.

Drinking is undoubtedly the moſt miſerable refuge from misfortune. It is the moſt broken of all reeds. This ſolace is truly ſhort lived; when over, the ſpirits commonly ſink as much *below* their uſual tone, as they had been before raiſed *above* it. Hence a repetition of the doſe becomes neceſſary, and every freſh doſe makes way for another, till the miſerable wretch is rendered a ſlave to the bottle; and at length falls a ſacrifice to what, at firſt, perhaps, was taken only as a medicine. No man is ſo dejected as the drunkard when the debauch is over. Hence it is, that thoſe who have the greateſt flow of ſpirits while the glaſs circulates freely, are of all others the moſt hipped when ſober. It may be pleaſant to get drunk, but the next day is a day of uneaſineſs, and the third ought to be a day of repentance. To thoſe who drink to drive away care, I would recommend the careful peruſal of the following lines.

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* Dr. Darwin.

Unhappy man, whom *ſorrow* thus and *rage,*
Two different ills, alternately engage.
Who drinks, alas! *but to forget,*—nor ſees
That melancholy, ſloth, ſevere diſeaſe,
Memory confuſed, and interrupted thought,
Death's harbingers, lie latent in the draught,
And in the flowers that wreath the ſparkling bowl
Fell adders hiſs, and poiſonous ſerpents roll.

PRIOR.

OF SUPPER.

A *late dinner* gives a long morning, and precludes the neceſſity of a hearty ſupper, and tea may become its ſubſtitute, and call together, to a cheap entertainment and the pleaſures of ſocial intercourſe, a meeting of cheerful friends. Abſtracted from the cares of the buſy day, having no variety of objects to draw off the atention, viewing the expreſſive and brilliant countenance of thoſe he is in converſe with, with ſpirits gently agitated, and cares diſpelled, he returns with the partner of his choice, from the ſplendid circle, and wakes the next morning refreſhed by a ſound and tranquil ſleep.

III. OF OLD AGE.

The *food* proper for *old age* has been before conſidered, when diſcourſing on *temperaments.*

SECT. XII.

ON CLEANLINESS.

THE under garment of *fleecy hoſiery* ought to be frequently changed, as it promotes the perſpiration, and is continually abſorbing it. Diſeaſes of the ſkin are chiefly owing to want of cleanlineſs. They may indeed proceed from other cauſes; but they ſeldom continue long where cleanlineſs prevails. To the ſame cauſe muſt we impute the various kinds of vermin which infeſt the human body, &c. Theſe may always be baniſhed by cleanlineſs alone, and wherever they abound, we have every reaſon to believe it is neglected. It is remarkable that, in moſt eaſtern countries, cleanlineſs makes a great part of their religion. Indeed the whole ſyſtem of the jewiſh laws has a manifeſt tendency to promote cleanlineſs. Whatever pretenſions people make to politeneſs and civilization, I will affirm, that as long as they neglect cleanlineſs, and appear naſty, they are ſtyled Goths and barbarians.

Few things are more unreaſonable, than the dread of cleanlineſs in ſick people. They had rather wallow in all manner of filth, than change a tatter of their apparel. Yet how refreſhed, how cheerful, how comfortable do people feel, when in health, upon being ſhaved, waſhed, and ſhifted! If cleanlineſs be proper for perſons in health, it is certainly more ſo for the ſick. By being neglected the ſlighteſt diſorders are often changed into the moſt *malignant*. The ſame miſtaken care which prompted people to prevent the leaſt admiſſion of *freſh air* to the ſick, ſeems to have induced them to keep them dirty. If the *fleecy hoſiery* waiſtcoat was changed on going to bed, which is the time we are in the habit of being expoſed to cold, there can be no danger of catching cold, nor can there be any impropriety of doing this at leaſt twice a week in the ſummer, and once in the winter. The only caution neceſſary, is to ſee, previous to its being put on, that it contains no dampneſs.

Cleanlineſs is certainly agreeable to our nature. It ſooner attracts our regard than even finery itſelf, and often gains eſteem where that fails. It is an ornament to the higheſt as well as the loweſt ſtation, and cannot be diſpenſed with in either.

I had occaſion, ſays the author of the Spectator, to go a few miles out of town, ſome days ſince, in a ſtage coach, where I had for my fellow travellers a dirty beau, and a pretty young quaker woman. Having no inclination to talk much, I placed myſelf backward with a deſign to ſurvey them, and to pick a ſpeculation out of my two companions. Their different figures were ſufficient to draw my attention. The gentleman was dreſſed in a ſuit, the ground whereof had been black, as I perceived from ſome few ſpaces that had eſcaped the powder, which was incorporated with the greateſt part of his coat: his perriwig, which coſt no ſmall ſum, was after ſo ſlovenly a manner caſt over his ſhoulders, that it ſeemed not to have been combed ſince the year 1782; his linen, which was not much concealed, was daubed with plain *ſpaniſh*, from the chin to the loweſt button; and the diamond upon his finger (which naturally dreaded the water) put me in mind how it ſparkled amidſt the rubbiſh of the mine, where it was firſt diſcovered.

On the other hand, the pretty quaker appeared in all the elegance of cleanlineſs. Not a ſpeck was to be found upon her. A clear, clean oval face, juſt edged about with little thin plaits of the pureſt cambric, received great advantage from the ſhade of her black hood; as did the whiteneſs of her arms from that ſober coloured ſtuff in which ſhe had clothed herſelf. The plainneſs of her dreſs was very well ſuited to the ſimplicity of her phraſes; all which put together, though they could not give me a great opinion of her religion, they did of her innocence.

This adventure occaſioned my throwing together a few hints upon *cleanlineſs*, which I ſhall conſider as one of the *half virtues*, as *Ariſtotle* calls them, and ſhall recommend it under the three following heads: as it is a mark of politeneſs; as it produces regard; and as it bears analogy to purity of mind.

Firſt, It is a mark of politeneſs. It is univerſally

ſally agreed upon, that no one unadorned with this virtue can go into company without giving a manifeſt offence. The eaſier or higher any one's fortune is, this duty ariſes proportionally. The different nations of the world are as much diſtinguiſhed by their cleanlineſs, as by their arts and ſciences. The more any country is civilized, the more they conſult this part of politeneſs. We need but compare our ideas of a female *Hottentot* and an *Engliſh* beauty, to be ſatisfied of the truth of what has been advanced.

In the next place, cleanlineſs may be ſaid to be the foſter mother of love. Beauty indeed moſt commonly produces that paſſion in the mind, but cleanlineſs preſerves it. An indifferent face and perſon, kept in perpetual neatneſs, has won many a heart from a pretty ſlattern. Age itſelf is not unamiable, while it is preſerved clean and unſullied: like a piece of marble conſtantly kept clean and bright, we look on it with more pleaſure than on a new veſſel that is cankered with ruſt.

I might obſerve *farther*, that as cleanlineſs renders us agreeable to others, ſo it makes us eaſy to ourſelves; that it is an excellent preſervative of health; and that ſeveral vices, deſtructive both to mind and body, are inconſiſtent with the habit of it. We find from experience, that through the prevalence of cuſtom the moſt vicious actions loſe their horror, by being made familiar to us. On the contrary, thoſe who live in the neighbourhood of good example, fly from the firſt appearance of what is ſhocking. It fares with us much after the ſame manner as to our ideas. Our ſenſes, which are the inlets of all the images conveyed to the mind, can only tranſmit the impreſſions of ſuch things as uſually ſurround them. So that pure and unſullied thoughts are naturally ſuggeſted to the mind by thoſe objects that perpetually encompaſs us, when they are beautiful and elegant in their kind.

OUR RELATIONSHIP TO MUSCULAR MOTION.

SECT. XIII.

ON ANIMAL ELECTRICITY; OR THE CAUSE OF MOTION IN THE VOLUNTARY ORGANS, OR MUSCLES.

DOES there appear any principle in all nature, ſays our Engliſh hiſtorian, more myſterious than the union of ſoul and body, by which the ſpiritual part poſſeſſes ſuch an influence over the material, that it is able to direct the motion of any muſcle, or even ſometimes a part of a muſcle? Were we empowered by a ſecret wiſh to diſplace mountains, or control the planets in their orbit; this extenſive authority would not ſeem more extraordinary or more unaccountable *. An accident, fortunate for philoſophy, has thrown, however, ſome light on this hitherto myſterious ſubject.

Whilſt Profeſſor Galvani, at Bologna, was diſſecting a frog, in a room where ſome of his friends were amuſing themſelves with an electrical machine, one of them happened to draw a ſpark from the conductor, as the profeſſor touched one of the nerves

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* Vide Hume's *Eſſays*. The ſame obſervation, in nearly the ſame expreſſions, may be found in Voltaire's *Ignorant Philoſopher*.

nerves of the animal. In an inſtant the whole body of the frog was ſhook by a violent convulſion.

The profeſſor was aſtoniſhed at the phenomenon, and believing it to be owing to his having wounded the nerve; to aſſure himſelf, whether this was really the caſe, he pricked it with the point of his knife, without any motion being produced: he now touched the nerve with the inſtrument as at firſt, and deſired a ſpark to be taken from the machine, on which the contractions were renewed.

The experiment was repeated a third time, but the animal remained motionleſs; however, as the ivory handle of the diſſecting knife was a bad conductor of electricity, he changed it for a metallic one, and re-excited the movements, which he conſtantly failed in doing whilſt uſing an electric ſubſtance.

After having made a great number of experiments with the electrical machine, he reſolved next to make trial of atmoſpheric electricity. To this end he raiſed a conductor upon the roof of his houſe, from which he brought an iron wire into his room, and to this attached metal conductors, connected with the nerves of the animals deſtined to be the ſubject of his experiments, and to their legs he tied wires, which reached the floor. Conſiderable movements were obſerved in the animals, whenever it lightened. Theſe preceded the claps of thunder, and always correſponded with their intenſity and repetition; and even when it did not lighten, the movements took place, whenever any thunder cloud paſſed over his houſe.

Having next laid bare the nerve leading to the wing of a duck, the ſciſſars of the operator being under it, whenever any of the company preſent applied a ſhilling, or a half crown, to the nerve ſo diſpoſed, the nerve was agitated by a violent movement, which occurred as often as the ſhilling or half crown was employed, till the nerve was exhauſted of its power, which happened commonly in about 15 minutes.

It was afterwards found, that if an half crown be placed in contact with the under part of the tongue, and a plate of zinc be applied to the upper part, on bringing the two metals into contact with each other, a pungent diſagreeable feel, which it is difficult to deſcribe, is produced at the point of the tongue.

And if a plate of zinc be placed between the gums and the upper lip, and a plate of gold be placed in the upper part of the tongue, when the gold is brought into contact with the zinc, the perſon ſees immediately a flaſh of lightning.

After performing this experiment repeatedly, I conſtantly felt, ſays Dr. Monro, the Profeſſor of Medicine at Edinburgh, a pain in my upper jaw, which continued for more than an hour. And in one experiment, after I had applied a blunt probe of zinc to the partition which divides the noſe into two noſtrils, and repeatedly touched it with a crown piece of ſilver applied to the tongue, I thereby produced the appearance of a flaſh of lightning, and ſeveral drops of blood fell from that noſtril. Dr. Fowler, after making a ſimilar experiment on his ears, obſerved a ſimilar effect.

The experiment of producing ſparks by ſtroking the back of a cat in froſty weather, readily ſhews that the electric fluid naturally exiſts in a very active ſtate in the bodies of ſome animals. Poſſibly, ſays the celebrated Dr. Prieſtley, the *light* which is ſaid to proceed from animals, as from wild beaſts, when they are in purſuit of their prey in the night, may not only ariſe, as it has hitherto been ſuppoſed to do, from the mere friction of their hairs or briſtles, but violent *muſcular exertion* may alſo contribute to it. *This light* may, with the electric flaſhes from their eyes, aſſiſt them occaſionally to catch their prey; as glow-worms and other inſects are provided with a conſtant electric light for that purpoſe.

Mr. Hartman having neglected to ſupply his paroquet with water to waſh himſelf, he obſerved that its feathers, in a ſtate of dryneſs, were endued with a proper electrical virtue, repelling one another, and retaining their electricity even a long time after they were plucked from the body of the bird, juſt as they would have done if they had received electricity from an excited glaſs tube.

The following is a very remarkable inſtance of the exiſtence of this fluid in the human frame, and of the eaſe with which it is put into action. Bridone, in his travels, mentions the ſtory of a lady, who, on combing her hair in froſty weather in the dark, had ſometimes obſerved ſparks of fire to iſſue from it; this made him think of attempting to collect the electrical fire from the hair, without the aſſiſtance of any other electrical apparatus. To this end he deſired a young lady to ſtand on wax, and comb her ſiſter's hair, who was ſitting in a chair before her; ſoon after ſhe had begun to comb, the young lady on the wax darted out ſparks of fire againſt every object that approached her. Her hair was ſtrongly electrical, and affected an electrometer at a conſiderable diſtance. He charged a metallic conductor from it, and in the ſpace of a few minutes collected a ſufficient quantity of electric fire ſo as to kindle common ſpirits, and by means of a ſmall jar, gave many ſmart ſhocks to all the company preſent.

Cavallo alſo mentions, that he obtained, by means of a ſmall condenſing plate, very ſenſible ſigns of electricity from various parts of his own body, and from the head of almoſt every other perſon on whom he made the experiment.

The celebrated John Weſley relates, that Mrs. Suſanna Sewall, in New England, at a certain time of the year, never changed her apparel without obſerving a ſtrange flaſhing of ſparks. In the company of ſeveral perſons, having taken off ſome of her wearing apparel, and ſhaking it, ſparks flew forth, making a noiſe much like bay leaves thrown into the fire. They deſired Mrs. Sewall one day to put on her ſiſter's garment; and when ſhe put it off, in the evening, it ſparkled as her own uſed to do.

It has often been obſerved, that when we wear worſted under-ſtockings, and ſilk over them, if we chance to draw off the ſilk ſtocking in the dark, the bright electric fluid is ſeen flaſhing from every part of the worſted under-ſtocking.

A variety of other curious facts clearly evince, that the electric fire is eſſentially connected with the animal body, and is continually exerting its influence on it.

The electric fluid, however, is far more conſpicuous in the body of the GYMNOTUS, which has the remarkable property of generating and throwing out its electricity much beyond the limits of its own ſyſtem. I have often, ſays Dr. Garden, when I have taken hold of the *gymnotus* with one hand, and put the other into the water over its body, without touching it, received a *ſmart ſhock*; and I have obſerved the ſame effect to follow, when a number of perſons joined hands, the perſon at one extremity of the circle taking hold of, or touching the electric fiſh, and the perſon at the other extremity putting his hand into the water over the body of the fiſh. The ſhock was communicated through the whole circle as ſmartly as if both the extreme perſons had touched the fiſh. I am told, continues Dr. Garden, that ſome of theſe fiſh in Surinam river, are upward of 12 feet long, whoſe ſtroke or ſhock proved *inſtant death* to any perſon who had the misfortune to touch it.

Monſ. Fermins, in his Natural Hiſtory of *Surinam*, publiſhed in 1765, alſo tells us, that making 14 perſons graſp each other by the hands, while he graſped the hand of the laſt with one of his, and with the other touched the GYMNOTUS with a ſtick, the whole number felt the ſhock, and he could not prevail on any of them to repeat the experiment*.

Dr. Prieſtley relates, that the ſenſation is ſtrongeſt when the fiſh is in motion, and is tranſmitted to a great diſtance, ſo that if perſons in a ſhip happen to dip their fingers or feet in the ſea, when the fiſh is ſwimming at the diſtance of 15 feet from them, they are affected by the ſhock.

Mr. Walſe gives us the following beautiful experiment, to prove that the *gymnotus* is very ſenſible whether the ſubſtances brought near him are proper or not for receiving the electric ſhock.

The ends of two wires were put into the water of the veſſel, which contained the animal; theſe wires were of ſome length ſtretched to their extent, and terminated in two glaſſes of water placed at a conſiderable diſtance from each other. Whilſt the apparatus remained in this ſtate, and the circulation was of courſe *interrupted*, the animal did not prepare to exerciſe his power, but the inſtant a ſpectator, or any conducting ſubſtance filled the interval, and rendered the circle complete, it inſtantly approached the wires, arranged itſelf, and gave the ſhock.

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* Vandelott makes two ſpecies of the *electric eel*, the black and reddiſh; though he acknowledges that, excepting the difference of colour and degree of ſtrength, they are not materially different.

The ſurpriſing property of the TORPEDO, in giving violent ſhocks to the perſon who takes it in his hands, or who treads upon it, was long an object of wonder. For ſome time it was generally reckoned to be a fabulous hiſtory; but at laſt the matter of fact being aſcertained beyond a doubt, *philoſophers* have endeavoured to find out the cauſe.

As an inſulated perſon cannot receive a ſhock from either of theſe extraordinary fiſhes, the identity of this fluid, and the electric fluid, is clearly aſcertained.

Mr. Hunter has well obſerved, ſays Sir John Pringle, that the magnitude and number of the nerves beſtowed on the electric organs of the *torpedo* and *gymnotus*, muſt appear as extraordinary as their effects; for if we except the important organs of our ſenſes, there is no part, even of the moſt perfect animal, which, for its ſize, is more liberally ſupplied with nerves than the *torpedo*: nor yet do theſe nerves of the electric organs ſeem neceſſary for any *ſenſation* that can belong to them; and with reſpect to *actions*, there is no part of any animal, however ſtrong and conſtant its actions may be, which enjoys ſo large a portion of them. If then it be probable, that *theſe nerves* are *unneceſſary* for the purpoſe either of *ſenſation* or *action*, may we not conclude, that they are ſubſervient to the management of the *electric fluid?*

Moſ. Reaumur has alſo reſolved it into the action of a vaſt number of *minute nerves*, ſituated in a line under the ſkin, which by their accumulated force gives a ſudden and violent ſhock. He obſerves, alſo, that when theſe animals have exhauſted their electric powers, they ſubmit quietly to every inſult; but having by a little reſt and time recovered their former force, they then haſtily repay the offence.

May not animals have a power, is the conjecture of the celebrated Dr. Prieſtley, of extracting from the blood the *electrical fluid*; the BRAIN then would be the great laboratory for that purpoſe; and by means of the NERVES, that great principle, thus exalted, would be directed into the *muſcles*, and contract them as *ab extra*.

The ingenious Monſ. Valli obſerves, alſo, that the ſize and number of the *nerves*, which are beſtowed upon the *electrical organs* of the TORPEDO and GYMNOTUS are truly extraordinary and aſtoniſhing.

The nerves of the *muſcles* in animals are likewiſe very large, and their minute ramifications ſo great, that ſeveral phyſiologiſts have been led to believe that muſcular contractile fibres are the ſame thing as nervous fibrils.

The blood-veſſels of the *electrical organs* are very numerous, follow the courſe of the nerves, and diſtribute the ſmaller branches along with them.

The quantity of veſſels expended upon the *muſcles* is alſo prodigious, and they likewiſe are found to accompany the courſe and diſtribution of the nerves.

There exiſts in *muſcles* as well as in the *electrical organs* of the torpedo and gymnotus, cylinders, partitions, and a great ſubdiviſion of parts.

Have we not therefore every reaſon to believe that our *muſcles* are ſo many *electrical organs*, each muſcle being as it were a battery, and muſcular intumeſcence and contraction, in conſequence of a ſort of exploſion produced by the animal or nervous electricity*? According to this hypotheſis our nervous and muſcular ſyſtems may be conſidered, ſays

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* I once happened, ſays Dr. Prieſtley, to lay a chain near my electric batteries, ſo as to make it return at a ſharp angle, in order to impreſs the form of the letter *b* upon the table; and obſerved, that on the diſcharge, the part of the chain that had been *doubled* was diſplaced, *and pulled about two inches towards the reſt of the chain.* At this I was ſurpriſed, as I thought it lay ſo that it could not ſlide by its own weight. Upon this I repeated the experiment with more accuracy. I ſtretched the whole chain along the table, laying it double all the way, and making it return by a very ſharp angle. The conſequence always was, that the chain was SHORTENED about *two inches*, and ſometimes more, *as if a ſudden pull had been given it.*

The contraction of a muſcular fibre may be *compared*, ſays the illuſtrious Dr. Darwin, to the following electric experiment. Let twenty very ſmall Leyden phials, properly coated, be hung in a row by fine ſilk threads at a ſmall diſtance from each other; let the internal charge of one phial be poſitive, and of the other negative alternately; if a communication be made from the internal ſurface of the firſt to the external ſurface of the ſays Dr. Beddoes, as a beautiful machinery, and muſcular motion, at leaſt that of animals analogous to man, would be a chemical operation combining *hydrogen* and *azot* with OXYGEN. This hypotheſis, though not perhaps capable at preſent of the ſtricteſt proof, appears highly probable. It accounts for the perpetual neceſſity of our imbibing OXYGEN AIR, and enables us to trace the changes undergone by this ſubſtance, from the moment it is received, till the moment it is expelled. During the contraction of the muſcles, OXYGEN combines with the elements above mentioned into *water* and *various ſalts*, among which the *marine* and *phoſphoric acids* deſerve particular notice. *In this ſtate* it is taken up by the *abſorbents*, and afterwards *exhaled* or *excreted*. Hence the neceſſity for OXYGEN AIR in the blood for *muſcular action*, and hence the reaſon why *motion languiſhes*, whenever *this principle is ſcantily ſupplied by the lungs*.

A very delicate experiment was made by Dr. Mayow, in the laſt century. A dog that was *panting* and *breathing* deeply, on receiving *arterial*, that is, *oxygenated* blood into one of his veins, inſtantly began to breathe ſo *calmly* that his reſpiration was ſcarce *ſenſible*. The animal here receiving from an *unuſual ſource* the ſuſtenance which is probably ex-

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the laſt in the row, they will all of them inſtantly *approach* each other, and thus SHORTEN a line that *might connect them together like a muſcular fibre*. Vide ZOONOMIA, p. 61.

pended by violent muſcular action, it became *therefore* no longer neceſſary to inhale it *rapidly* *.

The

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* The firſt hint of TRANSFUSION was given at Oxford, Anno 1658, by Dr. Chriſtopher Wren, Savilian Profeſſor of Aſtronomy there, who propoſed, to the honourable Mr. Boile, a method of TRANSFUSING LIQUOR into the veins of living animals.

In 1666 his hint was farther improved, at the ſame conſtant ſource of ingenuity and learning, by Dr. Richard Lower, who invented the method of TRANSFUSING BLOOD out of one animal into another.

He was followed by ſeveral ingenious men at London, and particularly by Dr. Edmund King, who rendered Lower's method of transfuſion ſtill more eaſy and commodious, And as it was intended by the *Royal Society* that thoſe trials ſhould be proſecuted to the utmoſt variety which the ſubject would bear, by exchanging the blood of old and young, ſick and healthy, fierce and timid animals; various experiments were accordingly made with ſurpriſing effects upon lambs, ſheep, dogs, calves, and horſes, &c.

From England this invention paſſed into France and Italy, where, after old and decrepit animals had the agility of their limbs reſtored by the transfuſion of young and healthy blood into their veins, and other wonderful things had been achieved, J. Denis, Doctor of Phyſic, at Paris, with the aſſiſtance of Monſ. Emerez, ventured to perform the operation on men in that city; and J G. Riva, a ſurgeon of great reputation, made the ſame experiments at Rome.

After ſome trials, Monſ. Denis publiſhed an account of a young man, that was cured of an uncommon *lethargy*, by transfuſing the arterial blood of a lamb into his veins: and another account of the cure of *madneſs* performed on a man 34 years old, by transfuſing the arterial blood of a calf into his veins, in the preſence of ſeveral perſons of quality and learning.

This

The paviours always make a deep inſpiration before they ſtrike down the ſtones, whereby they acquire a large proportion of *oxygen*, and make a loud

This daring enterpriſe having ſucceeded ſo well at the firſt ſetting out in France, it was alſo practiſed in England from the arteries of a young ſheep, into the veins of Arthur Coga, Nov. 23, 1667, at Arundel-Houſe, before a ſplendid company, by Dr. Edmund King, and Dr. Richard Lower. And Coga publiſhed, under his own hand, an account of the *great benefit* which he received from the operation.

The illuſtrious Haller obſerves, in his Phyſiology, that by tranſfuſion of blood, the whole machine of the animal is thereby endowed with a remarkable degree of *vivacity*.

Unfortunately this operation was performed on Baron Bond, the ſon of the firſt miniſter of ſtate in Sweden, who had an inflammation of the bowels, and was given over by his phyſicians, and ſoon after on a perſon in a *conſumption*; which attempts turning out unſucceſsful, the *practice* being *yet* in *its infancy*, and *unſupported* by *ſufficient documents*, it fell into *diſcredit*, and was *prohibited* by the KING'S AUTHORITY in *France*, and by the POPE'S MANDATE at *Rome*.

Thus was defeated a noble eſſay, begun with prudence in England, but imprudently purſued in France and Sweden, which, had the firſt trials on the human ſpecies been conducted with care and caution, might in time, ſays Dr. Mackenzie, have produced moſt uſeful and ſurpriſing effects.

The introduction of the *vital air* into the practice of phyſic, has thrown great light upon this intricate queſtion, and as, in TRANSFUSION, *venal* blood was removed while *oxygenated*, or *arterial* blood was ſupplied to the veins, the lungs the while imbibing the *vital air*, the coſtitution was made to *ſuperabound* with *oxygen*; hence aroſe, as Dr. Thornton obſerves in a letter to Dr. Beddoes, all the ſurpriſing phenomena of loud and forcible expiration, to admit of a larger portion of this principle to be expended in muſcular motion. Dr. Beddoes having for ſome time inhaled *vital air*, ſays "he not only felt himſelf "warmer, but certainly more *diſpoſed towards* and "*capable* of MUSCULAR EXERTION."

TRANSFUSION: but in the preſent inſtance, it acts alſo by *diſtention*, and the utmoſt care muſt be taken to adjuſt the right quantity of blood, which muſt be done by carefully noting the alteration of the pulſe.

When this experiment was made ſome years back at Cambridge, by Profeſſor Harwood, the blood of a *ſheep* was transfuſed into the veins of a *pointer*, who was previouſly bled; and more *arterial blood* being admitted than was *proper*, the animal, ſenſible of *plethora*, immediately ſet about eating *graſs*. An old bed-maker who happened to be preſent, cried out, "Lord, "Maiſter, your dog is already turning into a *ſheep!*" In other trials, the animal, after the operation, has wagged his tail, forgiven his maſter, and ſeemed, if any thing, more lively than uſual.

SECT. XIV.

HEAT PRODUCED BY EXERCISE.

It was ſhewn in the laſt ſection, that when muſcular intumeſcence took place, the *vital air* in the blood was decompoſed, forming certain chemical combinations, productive of the *vital flame.*

If I walk ſlowly along, for the ſpace of a quarter of a mile upon even ground, my *breathing* and *pulſe* are but little accelerated, and the *heat* of my body remains nearly the ſame as before. But if I walk at the ſame pace, and for the ſame diſtance, up a *ſteep hill*, or bearing a *heavy burthen*, my *breathing* becomes *ſhort* and *full*, and my *heart* beats *ſtrong* and *quick*, and the *heat* thrown off from my body correſponds with theſe increaſed internal movements.

It is natural to aſk, what is the cauſe of this *difference*, when the *ſpace*, the *ſpeed*, and the *actual movement* of the muſcles, are the ſame? It muſt certainly ariſe from the *quantity* of *nervous electricity* tranſmitted from the BRAIN to the muſcles in the *latter caſe*, where the body was *raiſed* up hill, or where a *weight* was carried, being *much greater* than when the body is *only moved*, without being lifted up, or without any additional weight upon it. For though the *motion* of the muſcles be the *ſame* in both caſes, yet the *increaſed* weight to be moved, required the *nervous exertion* to be much *greater* in the latter inſtance than in the former; and therefore the *will*, or *determination of the mind*, propelled a *greater quantity* of *nervous electricity*, from the BRAIN to the *muſcles* employed.

To the increaſed demand on the ſyſtem of OXYGEN AIR, to be *decompoſed* by the *nervous electricity* *, the accelerated *reſpiration* muſt be attributed; and from the increaſed quantity of OXYGEN AIR in the blood, we can account for the improved *digeſtion* †, and a more rapid *circulation*; and from all theſe cauſes, concurring with the *electricity* of the nerves, we are able to ſee clearly the reaſon of the increaſe of the VITAL FLAME.

If an animal, a man, for inſtance, in good health, be expoſed to a *temperate air*, in a ſtate of *reſt*, the quantity of *vital heat*, generated by the continued attractions of *oxygen* going on in the body, will be ſufficient, with a certain quantity of clothing, for maintaining the temperature of about 97 degrees,

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* The *oxygen air* thus procured to the blood from the want of the ſyſtem, is ſaid to proceed from the *vis medicatrix naturæ*, and by others from aſſociation or ſympathy. Thus the call of the ſtomach for food after a fever does not ariſe from the ſtimulus of the gaſtric juice, but from the *want* of the ſyſtem.

† Vide Sect. X. on the Balance betwixt Reſpiration and Digeſtion.

by

by which the ſolids receive their natural ſtimulus, the fluids retain their proper fluidity, and all the functions of life are duly performed, and a ſufficient quantity abounds to carry off the perſpirable fluid. If a man, expoſed to a *froſty air*, continues at *reſt*, the principles in his body attractive of *oxygen*, cannot generate a ſufficient quantity of *vital heat* to keep every part of the body at its right temperature; becauſe the coldneſs of the ſurrounding medium carries off *the heat* faſter than *they* can produce it; conſequently the ſolids and fluids of the extremities, and at the ſurface of the body, will become frigid, and the fibres torpid, and the death of the extreme, and laſtly of the vital parts, enſue. But, on the contrary, when a man expoſed to a *froſty air*, perceives the coldneſs, and torpor, ariſing from his body being deprived of its heat, faſter than the principles in his body attractive of *oxygen* can furniſh it; if he throws the *voluntary muſcles* into action, the quantity of *heat* generated by the *nervous electricity*, will be ſufficient to warm every part, and recover and maintain the natural temperature; although the air ſhall ſtill continue to withdraw rapidly the *vital heat* from the ſurface of the body.

Some very pleaſing experiments were made by the ingenious Dr. Peart, which prove that *partial exerciſe* conveys *a glow* over the *whole body*.

I. EXPERIMENT.

I put my hand, ſays he, firſt into cold water at 56 degrees of temperature. After fifteen minutes I withdrew it, and found the temperature of the water raiſed to 65.

It had gained, therefore, in fifteen minutes, 9 degrees of heat.

II. EXPERIMENT.

The ſame day I put my hand as before, but inſtead of keeping it, and my body, in a ſtate of perfect reſt, I threw many of the voluntary muſcles into action, and in fifteen minutes the water at 56 degrees was raiſed to 73.

Here it had gained 17 degrees of heat.

III. EXPERIMENT.

To prove that the exertion of any ſet of muſcles affects the quantity of heat generated within, and thrown off from the whole body, I introduced my hand into the ſame quantity of water, and at the ſame temperature as in the firſt experiment, and I puſhed my feet againſt a large book-caſe, firmly fixed by its own weight, and my arms were forcibly ſtretched out. By the exertion of theſe few muſcles only, without any motion of the fibres, ſo much of the *electric fluid* * was tranſmitted to theſe parts, and ſo much *heat* diſengaged, that its *ſtimulus* extended over the *whole body*, and the water in fifteen minutes roſe in conſequence to 14 degrees, that is, five degrees more than when the body was in a ſtate of perfect reſt.

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* Dr. Peart has the *nervous fluid.*

The ſame is proved, though not quite ſo philoſophically, by the vulgar mode of warming the body by throwing the arms acroſs; or by the more elegant, but partial, exerciſe of what are called dumb bells.

PRACTICAL OBSERVATIONS.

SECT XV.

ON THE NECESSITY OF USING EXERCISE.

To ſhew the abſolute neceſſity of EXERÇISE in *cold climates*, I muſt beg leave to relate the botanical excurſion of Sir Joſeph Banks, Dr. Solander, and others, on the heights at *Terra del Fuego*. Dr. Solander, who had more than once croſſed the mountains which divide Sweden from Norway, well knew that *extreme cold* produces a torpor and ſleepineſs almoſt irriſiſtible, he therefore conjured the company to keep always IN MOTION, whatever pain it might coſt them, and whatever relief they might be promiſed by an inclination to reſt: "*Whoever ſits down*, ſays he, *will ſleep; and whoever ſleeps, will wake no more*." Thus, at once admoniſhed and alarmed, they ſet forward; but while they were ſtill upon the naked rock, and before they had got among the buſhes, the cold was ſo intenſe, as to produce the effects that had been moſt dreaded. Dr. Solander himſelf was the *firſt* who found the inclination, againſt which he had warned others, irriſiſtible; and inſiſted upon being ſuffered to lie down. Sir Joſeph Banks intreated and remonſtrated with Dr. Solander in vain: down he lay upon the ground, though it was covered with ſnow; and it was with great difficulty that his friend kept him from *ſleeping*. One of his *black ſervants* alſo began to linger, having ſuffered from the cold in the ſame manner as the Doctor. Partly by perſuaſion, and partly by force, the company made them go forward. Soon, however, they both declared "they would go no farther." Sir Joſeph Banks had recourſe again to expoſtulation, but theſe produced no effect: when the black was told that if he did not go on he would in a ſhort time be frozen to death; he anſwered, *that he deſired nothing ſo much as to lie down and die.* The Doctor did not ſo explicitly renounce his life; he ſaid he would go on, but that he muſt firſt take ſome "*ſleep*," though he had before told the company that "*to ſleep was to periſh.*" They both in a few minutes fell into a profound ſleep, and after five minutes Sir Joſeph Banks happily ſucceeded in waking Dr. Solander, who had almoſt loſt the uſe of his limbs, and the muſcles were ſo ſhrunk, that his ſhoes fell from his feet; but every attempt to relieve the unfortunate black proved unſucceſsful.

The ten thouſand Greeks in their memorable retreat in paſſing through Armenia were expoſed, ſays Xenophon, to a conteſt ſtill more dangerous than the enemy, in which neither ſkill nor valour could avail. The ſnow fell in ſuch quantities during the night as completely covered the men with their arms. Their bodies when freed from the ſnow were benumbed and parched with the piercing coldneſs of the north wind. Many ſlaves and ſumpter horſes periſhed, with about thirty ſoldiers. It was obſerved that thoſe died who did not uſe ſufficient exerciſe. Xenophon came up to ſeveral ſoldiers who were lying down upon the ſnow, inſiſting upon their marching on; but although they had traverſed ſuch a great extent of country, and had the proſpect of reaching their homes, ſuch, ſays the hiſtorian, was the inclination to remain quiet, that many refuſed to move until their general threatened or inflicted violent puniſhment on them, even though they themſelves knew it to be the only remedy againſt their diſtreſs. As the ſeverity of the weather ſtill continued during the remainder of their march through Armenia, ſeveral ſoldiers loſt their ſight by the glare of the ſnow, and their toes and fingers by the intenſeneſs of the cold. The eyes, ſays Xenophon, were beſt defended by wearing ſomething black before them, and the feet were preſerved by *conſtant motion* in the day, and by ſtripping them bare during the night, and when froſt-bitten, the friction was obliged to be with ſnow.*

It was a principle among the ancients, that *acute diſeaſes* are from heaven, and *chronical* from ourſelves; to die, ſays Dr. Johnſon, is the fate of man, but to die with *lingering anguiſh* is generally his own folly. *Inactivity* never fails to induce an univerſal relaxation of the contractile fibres. When theſe fibres are relaxed, neither the *digeſtion*, the *circulation*, nor the *periſtaltic motion*, can be duly performed.

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* Vide On Aſphyxia from Cold.

It is abſolutely impoſſible to enjoy health, where the *perſpiration* alſo is not duly carried on; and that can never be the caſe where *exerciſe* is neglected.

The neceſſity of *action* is not only demonſtrable from the fabric of the body, but evident from the obſervation of the univerſal practice of mankind, who for the preſervation of health in thoſe, whoſe rank or wealth exempts them from the neceſſity of lucrative labour, have invented ſports and diverſions, though not of equal uſe to the world with agricultural employments, yet of equal fatigue to thoſe who practiſe them, and differing only from the drudgery of the huſbandman, as they are acts of choice, and therefore performed without the painful ſenſe of compulſion. The huntſman riſes early, purſues his game, through all the dangers and obſtructions of the chace, ſwims rivers, and ſcales precipices, till he returns home, no leſs haraſſed than the ſoldier, and has perhaps ſometimes incurred as great hazard of wounds or death: yet he has no motive to excite his ardour; he is neither ſubject to the commands of a general, nor dreads any penalties for neglect and diſobedience; he has neither profit nor honour from his perils and his conqueſt, but toils without the hopes of mural or civil garlands, and muſt content himſelf with the praiſe of his tenants and companions.

But ſuch is the conſtitution of man, that *labour* may be ſtyled its *own reward*; nor will any *external excitements* be requiſite, if it be conſidered *how much happineſs* is *gained*, and *how much miſery eſcaped*, by frequent and violent agitation of the body.

The deſire of *exerciſe* is *coeval* with life itſelf. Were this principle attended to, many diſeaſes might be avoided. But, while *indolence* and *ſedentary* employments prevent two thirds of mankind from either taking ſufficient exerciſe themſelves, or giving it to their children, what have we to expect but diſeaſe and deformity? The *rickets*, ſo deſtructive to children, called by the *French* the *Engliſh diſorder*, never appeared generally in Great Britain till manufactures began to flouriſh, and people, attracted by the love of gain, left the country to follow *ſedentary* employments in great towns*.

Every animal makes an early uſe of its organs of motion; and many young creatures, even when under no neceſſity of moving in queſt of food, cannot be reſtrained without force. This is evidently the caſe with the calf, the lamb, and the kitten. If theſe harmleſs animals were not permitted to *friſk* about and *take exerciſe*, they would ſoon die, or become diſeaſed; and ſo ſtrong is this *principle* implanted in the human breaſt, that a healthy youth can hardly be kept from exerciſe. This love of motion is ſurely a ſtrong proof of its *utility*. Nature implants no diſpoſition *in vain*. It ſeems a catholic law throughout the whole brute creation, that no creature, without *exerciſe*, ſhall be able to find ſubſiſtence. Every creature, except man, takes as much exerciſe as his nature requires. He alone ſleeps till late in the morning in beds of down, and often lolls all day in eaſy chairs, and deviating from the great law of his Creator, he ſuffers accordingly.

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* Dr. Buchan.

If faſhion muſt prevail, and young children be ſent to *crowded* ſchools, we would recommend it to their teachers, as *they value the lives of thoſe entruſted to their care*, and *the account they muſt one day give*, that they would allow their pupils a ſufficient time to *run* and *friſk* about, inſtead of keeping them *hour after hour* in cloſe and irkſome confinement, which ſubjects them to a dreadful train of diſeaſe, flatulence, indigeſtion, colics, worms, &c. &c. and hinders them hereafter from being *happy* and *uſeful* members of ſociety. From *this criminal folly*, ſays the emphatic Dr. Johnſon, proceed moſt of thoſe pains which wear us away ſlowly with periodical tortures, and which, though they ſometimes ſuffer life to be long, condemn it to be uſeleſs, chain us down to the couch of miſery, and mock us with the hopes of death.

Certainly man was never deſigned to be ſitting all day *croſs-legged* on a board. The *maſter*, who denies a ſufficient time for *exerciſe* to thoſe unhappy beings, whom PROVIDENCE has ſubjected to his will, has a dreadful reckoning to make, when each individual ſhall receive from the *ſame meaſure* he has meted out to others.

Were ſedentary employments intermixed with a due quantity of exerciſe, they would never do much hurt. It is conſtant confinement that ruins health. A man will not be injured by ſitting at his work three or four hours at a time; but if he be *obliged*, by an *unfeeling maſter*, to ſit eight or ten, he will ſoon be ſaid to drag on life inſtead of enjoying it. Weak and ailing, he will languiſh out a few miſerable years, and at laſt ſink into an untimely grave.

Weak fibres are the conſtant companion of *inactivity*. Nothing but daily *exerciſe* in the *open air* can brace and ſtrengthen the powers of the *ſtomach*, and prevent therefore an endleſs train of diſeaſes, which proceed from a relaxed ſtate of that organ. We ſeldom hear the active or laborious complain of what are called *nervous diſeaſes*; theſe are reſerved for the ſons of idleneſs. Many have been completely cured of theſe diſorders by being reduced, from a ſtate of opulence, to labour for their daily bread. This plainly points out the ſources from whence *nervous diſeaſes* flow, and the means by which they may be prevented.

Dr. Cheyne, in his excellent Treatiſe on Health, ſays, that the weak and valetudinary ought to make EXERCISE *a part of their religion*. We would recommend this, not only to the weak and valetudinary, but to ſedentary artificers, ſhopkeepers, ſtudious perſons, &c. &c. Such ought to conſider *exerciſe* as neceſſary *a duty* as to *take food*; and this might be uſally done without any great loſs of time or interruption to buſineſs.

Every man, in ſhort, ſhould oblige himſelf by ſome abſolute rule to engage in *daily exerciſe*. *Indolence*, like other vices, when indulged, gains ground, and at length becomes agreeable. Hence many who were fond of *exerciſe* in the early part of life, become quite averſe to it afterwards. Diſeaſes are engendered deſtructive of the reſolution of the mind. Nauſeous drugs are had recourſe to. The ſtimulus at the ſtomach ſpreads its influence for a time over the whole body. It at laſt loſes its efficacy, or becomes prejudicial, and the *pale*, *flatulent*, and *bloated hypochondriac*, flies from phyſician to phyſician, none of whom dare advife him EXERCISE, which he is averſe to, and ſays he cannot take, and he falls at laſt into diſeaſes of a more ſerious aſpect, and dies of ſpaſm in the ſtomach, or dropſy, or aſthma, or jaundice, or a cough with mucous expectoration, or palſy, or hæmoptoe, or ſome other diſeaſe that either ariſes from, or is always *engrafted* upon, a *weak* and *debilitated frame*.

——— Wearineſs
Can ſnore upon the flint, when reſty ſloth
Finds the down pillow hard.

SHAKESPEARE.

I ſhall

I ſhall conclude this long but *uſeful* eſſay with ſome beautiful lines from Armſtrong, whoſe poem, entitled *the Art of Preſerving Health*, might have poſſibly promoted the *diſcoveries* of the late Dr. Brown.

The ſhades deſcend, and midnight o'er the world
Expands her ſable wings. Great NATURE droops
Through all her works. How happy he whoſe *toil*
Has o'er his languid powerleſs limbs diffus'd
A *pleaſing laſſitude.* He not in vain
Invokes the gentle deity of dreams.—
By toil ſubdu'd, the warrior and the hind
Sleep *faſt* and *deep:—their active functions ſoon*
With generous ſtreams their ſubtle tubes ſupply.
Ere morn *the tonic irritable nerves*
Feel the freſh impulſe, and awake the ſoul.

SECT. XVI.

OF THE BRAIN AND NERVOUS SYSTEM.

May not animals have a power of extracting from the blood the *electrical fluid?* The BRAIN then would be the great laboratory for this purpoſe. PRIESTLEY.

IT would be foreign to this publication to enter here into a minute deſcription of the BRAIN, the MEDULLA SPINALIS, and the NERVES which proceed from thence, affording *ſenſation* and *motion* to the different parts of the animal frame. Suffice it then to ſay, that theſe are compoſed of two diſtinct parts; the MEDULLARY, or FIBROUS; and the CORTICAL PART, or VASCULAR: which parts are inveſted by their proper membranes, called the PIA, and DURA, MATER.

The *outer* or *cortical part* of the brain, ſpinal marrow, and nerves, are exceedingly *vaſcular.* Rhuyſch has made this very evident by his preparations. After a ſucceſsful injection of his ceraceous matter into the carotid arteries, he found the cortical part of the brain became red; then ſeparating a red portion of it from the reſt, but cohering with the branch of an artery, and macerating it in water, till the membranes putrified and diſſolved off, he put what remained in ſpirits of wine, and found it to be red, very tender, flocculent, a fleecy, coherent ſubſtance, filled and tinged red, as far as the injection had reached; the oily nature of which had hindered it from being diſſolved in water, as the membranes, and other parts that were not filled, had been. Such preparations Rhuyſch often made, and found the experiment ſucceed in like manner with the CEREBELLUM, SPINAL MARROW, and NERVES.

Now we have before ſhewn, that in every contraction of the heart, a very large quantity of blood was ſent almoſt in a ſtraight line from the heart, and therefore the blood, from its proximity to the brain, muſt move with a proportionate velocity. Haller computes that the heart ſends to the brain one ſixth of the whole maſs of blood, Monro at leſs. Let us therefore ſuppoſe, that the quantity thrown out by the left ventricle, at every pulſe, is only one ounce and a half, which is a very low value, as the exacteſt and lateſt meaſures of the capacity of the ventricle run from one to three ounces. A ſixth part of this is a quarter of an ounce. Let us take the number of pulſes to be 60 in a minute, or 3600 in an hour, which is a very ſlow pulſe. By this eſtimate, 900 ounces, or fifty-ſix pounds and four ounces, of *oxygenated* or arterial blood muſt arrive at the cortical part of the brain in an hour, which amounts to 1349 pounds in the natural day to be returned to the four jugulars back again to the heart *unoxygenated.*

As ſo great a quantity of blood arrives at the brain in ſo ſhort a ſpace of time *oxygenated* (and though it were taken double, there would be no exaggeration of the matter), and paſſes thence *unoxygenated,* is it not reaſonable to ſuppoſe, that in the ſubtle vaſcular texture of the *cortical ſubſtance* there is ſtrained off, or ſecreted from the *arterial blood,* a fluid, the fineſt, moſt attenuated, and moſt moveable in all the animal body, a fluid analogous to the matter of fire, or the *electric fluid?* and ſince the *medullary ſubſtance* of the brain is of a *fibrous compoſition,* the threads of which are diſpoſed in a parallel direction (as is particularly obvious, even to the naked eye, in the corpora ſtriata, the thalami of the optic nerves, eſpecially of fiſhes, in the fornix and other parts of the brain when immerſed in the nitrous acid), does not this ſubtle and penetrating fluid therefore cling to the MEDULLA, and paſs along the NERVES at the command of the will, which are evidently of the ſame texture as the *brain,* juſt as the *electric fluid* is retained by the *main conductor,* and paſſes along a *wire* connected to it? If ſo, we have anſwered the queſtion propoſed by Sir Iſaac Newton, "Is not *Viſion* produced by an "*ethereal fluid,* or ſomething analogous to this me-"dium, excited in the bottom of the eye by the "impulſe of light, and propagated along the ſolid, "pellucid, and uniform fibrillæ of the optic nerves "to the place of ſenſation?"—"And is not *Hearing* "performed by the movement of this, or ſome other "analogous fluid, excited in the auditory nerves by "the percuſſion of the air along the ſolid, pellucid, "and uniform fibrillæ of thoſe nerves into the place "of ſenſation, and ſo of the *other ſenſes?*"—If ſo, theſe threads or fibres, called NERVES, are ſo many *electric conductors.* The *electricity* of each fibril is excited apart, and each part impreſſes a ſtroke upon the brain, which is proportioned to the impulſion they receive, and to the excitement of the *electric matter.* In this caſe, every nerve excites diſtinct impreſſions. Not only ſeveral impreſſions are made at the ſame time, but they are effected with a rapidity that refutes the idea of ſluggiſh matter, and which belongs uniquely to the *electrical fluid.* One may hear three or four ſounds in ſucceſſion, very diſtinctly, in the ſpace of a quarter of a ſecond. Between the time of touching a body, and the conſciouſneſs of it taking place, there is ſcarce any intermediate ſpace which can be calculated by the known meaſures of time. However the ſenſation *remains* for a ſhort time after the object is gone. Thus, to uſe again the expreſſions of the immortal Newton, "If a ſtick burnt at one end be nimbly "moved round in a circle, with gyrations conti"nually repeated, the whole circle will appear like "fire; the reaſon of which is, that the ſenſation of "the burning body, in the ſeveral places of that

" circle *remains* impreſſed upon the brain until the " burnt end returns again to the ſame place. And " ſo in the quick conſecution of colour, if all the " ſeveral colours into which light may be divided " by the priſm, be painted on a card in their due " proportion, and whirled round any pointed body, " the impreſſion of every colour *remains* on the ſen- " ſorium, until a revolution of all the colours be " completed, and that firſt colour return again. " The impreſſions therefore of all the ſucceſſive " colours *are at once in the ſenſorium*, and beget a " ſenſation of *white*." Thus alſo common *electricity* has a loitering pace, not eaſily reconcileable with its common immeaſurable velocity.

The cauſes which excite ſenſation being without the body; to wit, the objects of the five ſenſes; and external with reſpect to the medullary part of the brain, is it not reaſonable to infer, that ſenſation is produced by the reflux of the *electric* or *nervous fluid* moving along the nerves towards their origin, occaſioned by the impulſe of its objects or cauſes? Or is this fluid expended, and drawn off, and ſenſation the reſult of the determination of the *electric*, or nervous fluid, to the part ſtimulated?

In the exerciſe of voluntary muſcular motion, it is no leſs natural to conclude, that the *electric fluid* is, by an effort of the mind, operating in a manner inſtantaneouſly, ſent from its origin in the beginning of the medullary part, along the nerves, which are continued into the mechaniſm of the muſcles.

With reſpect to the operations of the mind or ſoul, as *will*, *conſciouſneſs*, *memory*, *imagination*, *judgment*, &c. it is reaſonable to ſuppoſe, that theſe are attended with reſpectively different motions of *this fluid*, ſeparated from the CORTICAL and attracted by the MEDULLARY PART of this *wonderful organ*, the maſterpiece of creative ſkill. We ſee this verified every day, when more or leſs of ſtimulating food, altering the action of the heart, a few drops of a certain liquor, or ſome grains of opium, entirely change our manner of ſeeing things, and conſequently of judging of them. Do we but ſtand for a few ſeconds on our head, or turn round, and alter in the brain the current of blood, and how is the image of man, erect, and viewing the heavens, reverſed! He who could exclaim, "*Theſe are* THY *wondrous works*; *how wondrous then* THYSELF!" If more or leſs blood, or that not duly ſupplied with the vital principle in the air, be tranſmitted to the brain, how would the ideas of this ſublime poet, reſpecting hideouſneſs and holineſs, vice and virtue, be confounded! In the delirium of a fever, even in the mind of a Locke, how unproportioned to the reality would be the repreſentation of things!

Moreover, as the faculty of thinking in general ripens and comes to maturity with the body, it is alſo obſerved to decay with it; and if, in ſome caſes, the mental faculties continue vigorous in extreme old age, or when the body is enfeebled, it is evidently becauſe, in ſuch particular inſtances, the brain is not much diſturbed by the general cauſe of bodily weakneſs. But, on the other hand, if the brain itſelf be diſturbed, as by actual preſſure within the ſkull, by tumours, abſceſſes, inflammation, and, in a natural way, by ſleep, the mental faculties are always proportionably affected.

At Paris there was a man whoſe head had been broken and trepanned. If the ſilver plate was removed, and the *cortical part* of the brain preſſed, his ſight would become dim; and if the preſſure was increaſed, he would exhibit the abolition of ſenſe and motion, or apoplexy, and immediately upon taking away the preſſure (which he earneſtly begged might be continued but a very ſhort time), all his faculties returned unhurt.

The connexion of *mind* and *matter* however muſt not be *confounded*. The UNDERSTANDING, indeed, is the reſult of *mechaniſm*. The brain is an infinite aſſemblage of minute threads. Theſe acquire force by exertion; thus, in learning to repeat by memory, the *electric* impulſe of each word becomes concatenated, ſo that by reading the ſame thing over and over again, the whole leſſon is acquired: thus the multiplication table is readily got by rote, and, when a boy is aſked, how much is 4 times 9? he begins 4 times 4 is 16, and ſo gets down at laſt to 4 times 9 is 36.

To evince *the fibrous ſtructure* of the *organs* of *ſenſe*, the *retina* of an ox was ſuſpended in a glaſs of warm water, and ſome cauſtic alkali being added to it, as the adhering mucus was corroded, the *hair-like fibres* remained floating in the veſſel.

Hence it ſeems, that the *organs* of *ſenſe* are compoſed of *minute fibres*; and it is probable that the *locomotive muſcles*, as well as the *vaſcular ones*, of microſcopic animals have much greater *tenuity* than *theſe fibres* of the *retina*.

Beſides the *ſimilar laws*, which will be ſhewn in this volume to govern alike the actions of *ſentient* and *muſcular fibres*, there are many *other analogies* which exiſt between them.

They are both originally excited by *irritations* from without, are *alike* ſtrengthened and fatigued by exertions, are *alike* painful if excited into action when *inflamed*, and are *alike* ſubject to *ſpaſm*, *paralyſis*, and the *torpor* of declining years.

The *retina*, as was before ſhewn, is an expanſion of the optic nerve. Its branches are compoſed of infinite fibres. A part of theſe being exerciſed conveys a diſtinct idea. If the impulſe be ſtrong, the object is clear; if weak, the object is diſtant, and confuſed.

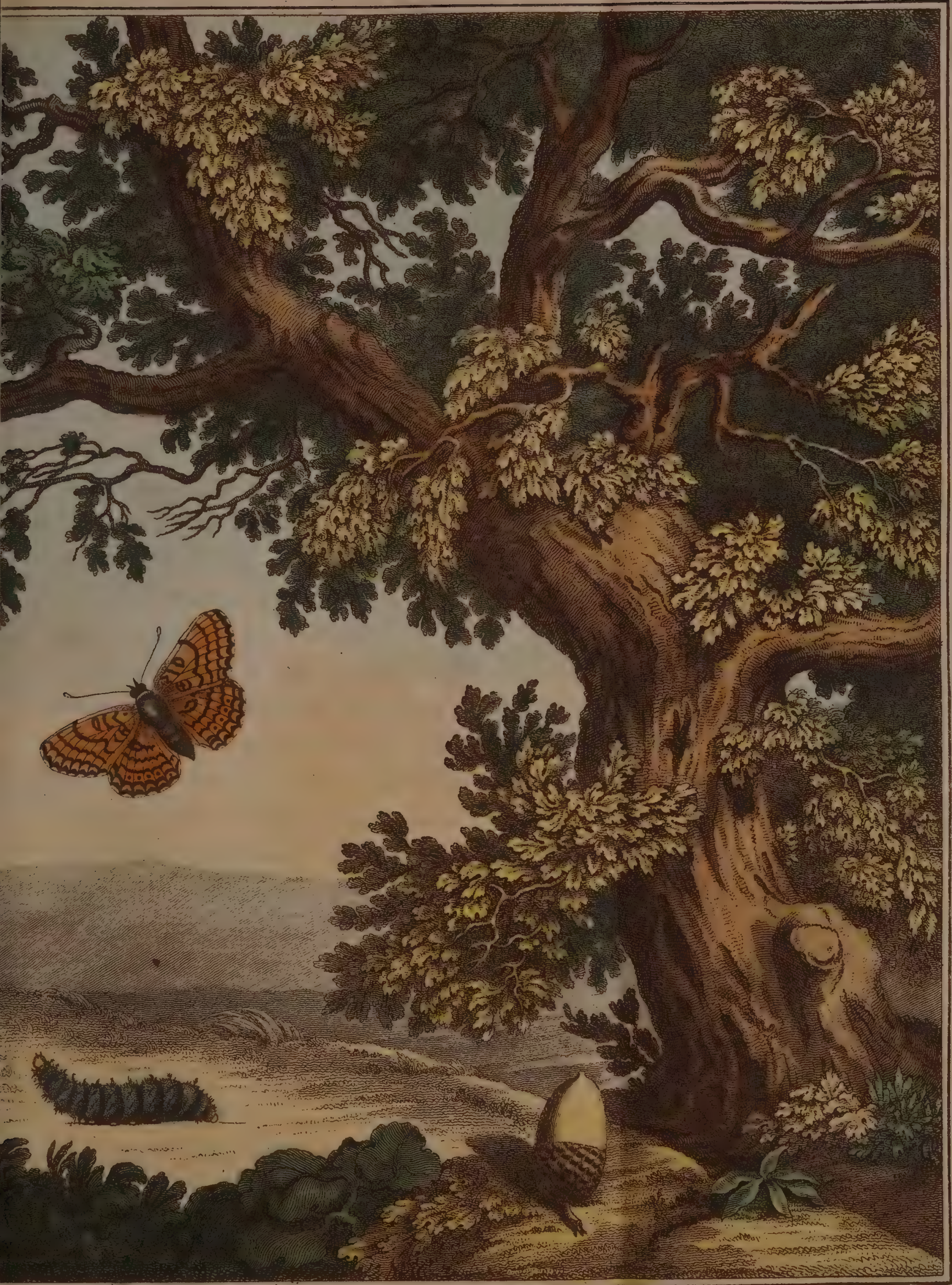
It is probable that ſight bears no reference to the image of objects; no more than a looking glaſs ſees, becauſe it reflects the image of different objects: the image on the concavity of the eye is topſy turvy, and double to thoſe who have two eyes; but the idea is the reſult of *impreſſion* upright and ſingle.

By this organ we can clearly explain our notion of INTELLECT as dependant upon *mechaniſm*. If the mechaniſm of the eye be defective, we can acquire no ideas which reſult from this ſenſe. If the optic nerve be palſied, or, on the contrary, if inflamed, that is, ſupplied with too much *blood*, or if *jaundiced*, ſight is loſt or imperfect; or if we make gyrations round one foot with the eyes ſhut, when we afterwards open them, the image of objects will appear in rotatory motion.

The anatomiſt, contemplating the *different ſtructures* wherein the *ſame offices* are deſigned by an OMNIPOTENT POWER, diſcovers, "*that in animals the differences in ſtructure affixed to the organs of ſenſation conſtitute the main differences in perception*;" for where the ſenſe of ſmell, &c. as in the dog, is more acute than in us, the figure of that organ is more complex, and diſcloſing a greater degree of art: and "*that the powers of the nerves depend on the ſtructure of the parts to which they are connected.*" Thus the nerve, which goes to the tongue, gives the ſenſation of taſte, and ſupplies alſo the muſcles moving that organ. The par vagum, which gives ſenſation to the ſtomach and lungs, likewiſe affords the power of motion to the muſcles of the throat. And thus the ſenſation of touch may ariſe from the ſame nerves which pervade the muſcular fibres.

This doctrine is beautifully diſplayed by the invaluable muſeum prepared by that firſt of anatomiſts and naturaliſts, the late John Hunter. Let it not, however, lead the enemy to philoſophy (for ſome ſuch characters there are) to object to him on that account Materialiſm and the Diſbelief of the doctrine of a future ſtate.

For, however ſight may depend on *mechaniſm*, ſtill it muſt not be *confounded* with it. The MIND or SOUL has a much higher origin than that of the periſhable frame with which it is at preſent connected. It is neither *nerve* nor the *electric fluid*. Theſe are only *its agents* in this its incarcerated ſtate. When the "*ſilver cord*" is broken, which connects MIND and MATTER together, vitality ceaſes, the *body* then, with all its artful and numerous veſſels, fibres, and nerves, and other exquiſite *machinery*, undergoes decompoſition, and is turned into its original elements; but the IMMORTAL SOUL, having ſhaken off this coil, is deſtined for a new reſidence; to flouriſh in eternal youth; to outlive the wreck of elements, and the craſh of worlds. It is embodied even in its reſidence in another world. "Thou fool," ſays the philoſopher and apoſtle, "that ſeed which thou ſoweſt is not quickened except it die. And that which thou ſoweſt, is not *that body* which ſhall be: but GOD *giveth* it *a body* as it hath pleaſed HIM, and to *every ſeed* its *own body*. —*So alſo* the *reſurrection* of the dead. The body is ſown (in the earth) in *diſhonour*, it is raiſed in *glory*; it is ſown in *weakneſs*, it is raiſed in *ſtrength*. It is ſown a *natural body*, it is raiſed a *ſpiritual*. Behold, I ſhew you a myſtery. We ſhall not all ſleep, but we ſhall all be *changed*. In a moment, in the twinkling



Ryley Del.

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EMBLEMS OF IMMORTALITY

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ling of an eye, at the laſt trump; for the trumpet ſhall ſound, and the dead ſhall be raiſed *incorruptible*, and we ſhall be *changed*. For this *corruptible* muſt put on *incorruption*, and this *mortal* muſt put on *immortality*."

Man, therefore, is not what he will hereafter be. What we diſcover of him here below, is only the *groſs foldage* under which he drawls upon the earth, and which he muſt ſhortly *caſt off*.

Could not the *omnipotent* AUTHOR OF NATURE, who pre-ordained all beings from the beginning, who originally encloſed the *gaudy* and *winged butterfly* in the *chryſalis*, the *plant* in the *ſeed*, compriſe the *ſpiritual body* in the *animal?*

The *animal body* has no other relation than to this earth. The *ſpiritual body* will have *enjoyments* which ear hath not heard, nor hath it entered into the heart of man to conceive; *new ſenſes* will diſcloſe themſelves, and, by multiplying in an almoſt infinite degree his perceptions, his ſphere will be agrandized, and he will be equal to ſuperior intelligences.

REVELATION informs us *it will be ſo*; and the parable of the *ſeed* is the moſt expreſſive and philoſophic emblem of this wonderful pre-ordination.

The *ſenſes*, as they will be brought into ſubjection to the ſoul, will no longer rule over her. Separated from *fleſh* and *blood*, there will remain in her none of thoſe earthly affections which reſulted from them. Tranſported into the regions of light, the human underſtanding will preſent no ideas to the will but thoſe of the higheſt good. It will then have no other than lawful deſires, and God will be their conſtant and ultimate end. It will love HIM from gratitude; will fear HIM from a principle of love; and will adore HIM as the *ſupremely amiable Being*, and as the *Eternal ſource* of life, perfection, and happineſs.

Chriſtians, who believe this doctrine of life, can ye have any dread of *death?* Your immortal ſpirits continually cleave to matter, and they are indiſſoluble; being henceforth united to an *unperiſhable* and *differently organized body*, ſhe looks upon *death* as a happy *transformation*, which, by diſengaging the ſeed from its foldage, will give a new being to the plant. "*O death, where is then thy ſting! O grave, where is thy victory!*"

SECT. XVII.

OF GANGLIONS.

Besides progreſſive motion, the various movements of the hands, and other parts of animal bodies, which are performed by *muſcles* curiouſly faſhioned for each purpoſe and wiſely diſtributed, there are *other motions* that, on the contrary, have little or no dependance on our inclination. Of this kind are the actions of the heart; the circulation of the blood; the motions of the ſtomach, and inteſtines; the progreſs of the chyle to the ſubclavian vein; the movement of the various ſecreted liquors, ſuch as the gall, the ſaliva, &c. Theſe, together with the lungs in reſpiration, have received the denomination of VITAL OR INVOLUNTARY MOTIONS, becauſe they go on without any conſcious exertions of the intellectual principle.

If ſuch a variety of nice and complicated movements had been left to the determination of the will, it had occupied every moment of our thought, and had ſtopped during ſleep, when conſciouſneſs is totally obliterated. We therefore here clearly diſcern the goodneſs of the ALMIGHTY, which has given man the abſolute direction of no movements, but what are eaſily performed, and which contribute alſo to health and pleaſure.

Phyſiologiſts were long perplexed to account, *how parts ſupplied with* NERVES *could be inſenſible*; and *how, though all the nerves terminate in the common ſenſorium or brain, over ſome organs the influence of the will extended, whilſt the motions of others were* INDEPENDANT *of that principle* They allowed the propriety of the final cauſe, and referred it to the wiſdom of GOD primarily, whereas *philoſophy* ſhould look for *ſecond cauſes**, which demonſtrates the ſame goodneſs, with ſtill greater power, in our beneficent CREATOR.

The ſolution of this difficulty was reſerved for the glory of the preſent age. The GANGLIONS, which are hard and callous bodies attached to thoſe nerves which ſupply the organs which have involuntary motion, did not indeed eſcape the all prying eye of anatomy: but their *uſes* were long wholly unknown. Conjectures were indeed formed that they were muſcles capable of contractions by which the nervous ſpirit was accelerated and impelled forwards: but they have been ſince found, from the experiments of the illuſtrious De Haller, incapable of ſuch contraction, being wholly devoid of irritability. They have been repreſented as little brains to ſupply that afflux of nervous fluid which the inceſſant motions of the organs to which they went

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* Ariſtotle, Cicero, Galen, Bacon, Boyle, Newton, and Locke, all concur in allowing that the *laſt link* in the chain of natural cauſes terminates at the throne of GOD.

ſeemed

ſeemed to require. Repetition and authority gave conſiderable weight to theſe conjectures, and we therefore are the leſs ſurpriſed that Dr. Johnſon, the ingenious and learned diſcoverer of their *real uſe*, ſhould complain:

“ It requires a long ſeries of years for the ad-“ miſſion of *new* truths. The period cannot be “ limited to thirty or forty years.

“ It depends on circumſtances peculiar to the “ age, the ſubject, and the author's ſituation: and “ mine has no peculiar advantages.

“ It is thirty years ſince my early thoughts on the “ *uſes* of the GANGLIONS of the nerves was com-“ municated to my correſpondents Dr. Whytt and “ Baron de Haller; and twenty years ſince, on ma-“ turer reflection, I publiſhed an account of this “ *diſcovery* to the world.

“ My opinion has been ſilently attacked, and as “ ſilently adopted, without any explicit acknowledg-“ ment of the author, or any direct quotation from “ his work. Several of the objections which I have “ anſwered, were communicated in a correſpondence “ with which I was honoured by Baron de Haller: “ and I have reaſon to think, from a letter afterwards “ received, my anſwers were ſatisfactory.

“ My ideas were received by Dr. M‘Kettrick, “ and my work ingeniouſly analyzed by the cele-“ brated Tiſſot. I ſay nothing of the private, and “ perhaps partial, teſtimonies of my correſpondents.

“ *But before truth, in its ſilent or diſputed march,* “ *has*

"*has rouſed the attention of the indolent, converted the*
"*ſupercilious, ſubdued the intereſted and obſtinate, and*
"*reached the ears of all, an age has paſſed away.*"!!!

Ganglions, as we before obſerved, are attached wholly to nerves which ſupply the organs which have *involuntary motion*, and being NON-ELECTRIC BODIES*, *are the* CHECKS *which prevent our volitions from extending to them* †, *and alſo ſenſation from reaching the common ſenſorium.*

The motions of the largeſt maſſes, and the moſt minute particles of matter, all performed with the ſame order and eaſe, and regulated by laws ſurpriſingly ſimple and extenſive, penetrating the inmoſt receſſes of bodies, and extended throughout the univerſe, evince the direction of an Omnipotent Almighty Power actuating the whole.

In every part and operation of nature, the fitneſs of things to one another, and their ſubſerviency to the beſt ends, and to the uſe and felicity of intelligent beings, point out the conſummate wiſdom and goodneſs of one GREAT ARTIFICER, one ORIGINAL MIND.

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* If you ſtimulate any where a nerve *not* ſupplied with GANGLIONS, all the irritable fibres will be thrown into a ſtate of action through the whole extent of the minute ramifications of that nerve: but, on the contrary, ſtimuli do not affect the heart, inteſtines, &c. when applied on the nerves *above* the GANGLIONS, but acting juſt *below* them, theſe organs are inſtantly ſtrongly affected.

† In violent fits of paſſion the accumulated electric fluid of the nerves however paſſes theſe barriers, and the vital organs are immediately in agitation, and ſometimes death enſues.

The courſe of nature is undoubtedly the effect of the inceſſant direction of the DEITY, no leſs than its creation and original arrangement: it ſeems impoſſible, and incomprehenſible, that any mechanical power, any organization of mere matter, could of itſelf, without direction, or art, produce vegetables and animals, all machines of exquiſite conſtruction, at all times and every where ariſing, being in the ſtricteſt regularity and aſtoniſhing profuſion: taſting life, and by an eſtabliſhed order, made inſtinctive and blind inſtruments to beſtow it upon others, and then retiring from this ſtage of exiſtence as it were to make room for theſe.

The verdure of the field, and all its flowery plants, the humble ſhrub, the lofty trees, in infinite variety, are his conſtant care, as well as his bounteous gift. Sole giver of life, HE inſpires with animation the meaneſt inſect, and moſt abject reptile, no leſs than the more perfect and nobler animals, and by HIS wiſdom guides them all to the ſeveral ends of their exiſtence.

Every thing, in fine, on earth and in the heavens, manifeſts and preſents HIM to us; and in the wonders of the loweſt, as well as the moſt magnificent of his works, the underſtanding with adoration traces the perfections of a CREATOR, who is not far from any one of us, for "*in his image created he man* *."

The mechaniſm of our body, the connexion and ſubſerviency of all its parts to a common purpoſe, the exquiſite contrivance of its organs, conſiſting of ſuch various minute veſſels, interwoven with wonderful art, have led anatomiſts in all ages to acknowledge an infinite wiſe and powerful MAKER. Among the moſt precious remains of antiquity, are thoſe commentaries of Galen written on the uſes of the ſeveral parts of the human body, as hymns and offerings of praiſe to the great CREATOR.

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* If we impoſe a ſilence on our ſenſes, and ſhut ourſelves up for a while in the inmoſt receſſes of our thoughts, and baniſh all earthly ideas, we ſhall then perceive the image of the TRINITY we adore. "Let us create *man after our* "*image*," ſays our CREATOR.—We muſt now ſeparate all idea of earthly parts, in order to comprehend this ſublime myſtery. Buried in deep contemplation, we firſt cannot but acknowledge a MIND which begets IDEAS, from whence proceed inward SATISFACTION or PAIN.—The *mind* is the UNDERSTANDING; the *ideas*, if written, are expreſſed by WORDS, and the *ſatisfaction* or *pain* is the DISPOSITION of ſoul reſulting from both.—We cannot ſeparate the *three*;—and ſuppoſing the *three* ETERNAL, neither is *one, before*, or *after the other*.—The THOUGHT, which we perceive ſprings up in our mind, is an image of the SON OF GOD.—Wherefore this SON OF GOD is called the WORD, and reſulting from BOTH is the HOLY GHOST, or LOVE, for GOD is LOVE. With this conception of the *Trinity*, which may be ſeen in the works of St. Auguſtin and other of the ancient fathers, the Scriptures are *intelligible* to all perſons, and not that *incomprehenſible thing* which an improper interpretation may render it.

Is

Engraved by J. Caldwall

GALENI CONVERSIO.

Is it, indeed, otherwiſe conceivable how ſuch conſiſtency and harmony could have taken place in the different parts of our wonderful frame? How they could have ſo exactly fitted to each other, and to the exterior objects, which have an evident relation to them, and the ſyſtem they compoſe? Could the bones *, which in all amount to four hundred, and the muſcles, which are ſtill more, and are each ſo well diſpoſed for motion, be adjuſted without a ſuperior knowledge in mechanics? The eye, ſo admirably adapted to light, and appropriated to viſion, was it formed without a knowledge of optics? Or the ear, without the ſcience of ſounds? Even our inclinations and paſſions, thoſe ſources of ſo much apparent ill, are, by the DEITY, providentially rendered the means of our preſervation, both as individuals and a race; and the ſelfiſh and ſocial affections, like centripetal and centrifugal forces, conduct us with proper force to the ends intended by our MAKER to be produced by them. Yet the love of life and all its enjoyments, the fear of death and all its dreadful harbingers, and the ſocial affections and all its endearments, would not have been ſufficient ſecurity for our carrying on the *vital motions*, with that conſtancy and uniformity neceſſary to the preſervation of life, if, thus engaged, theſe motions had depended upon our will and choice.

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* Vide the Plate, GALENO CONVERSIO, *The Converſion of Galen.*

Reaſon would have deliberated concerning them with too much ſlowneſs, and volition would have executed them often with a dangerous and fatal caprice. For, if the heart had been ſubjected to the ſoul's authority as much as the voluntary muſcles are, if its motions could have been ſuſpended or ſtopt with the ſame facility, death would then have coſt us no painful pang: and, whenever the body was tortured with diſeaſe, and the mind in anguiſh from grief or diſappointment, a remedy ſo eaſily applied might have been too frequently reſorted to, and yet more unfortnate beings might have ruſhed uncalled into the preſence of HIM who ſtationed us for the wiſeſt reaſons here on earth.

The preſervation of life therefore greatly depends upon our *vital motions* being entirely ſubject to the wiſe government of the Author of our lives; who charges HIMSELF with the immediate care of them, and of us.

All this, when attentively conſidered, muſt affect us with a ſenſe of GOD's goodneſs; who, reſpecting the imbecility of man's nature, hath been pleaſed, by appetites and paſſions, to excite him to acts of ſelf-preſervation; where the violence of theſe might have been hurtful, no leſs than the ſlowneſs and inſtability of reaſon, hath taken our ſafety under his more immediate direction. To attribute contrivances like theſe, and even underſtanding itſelf, to unintelligent cauſes, rather than to the all-wiſe

Parent of Nature, ſeems an incomprehenſible perverſion of reaſon and philoſophy.

That mind muſt be ſtrangely prepoſſeſſed and bewildered with falſe ſcience, which rather ſeeks for the cauſe of theſe involuntary motions, in dead matter, organization, chance, neceſſity, ſomething that, without knowledge or power, acts wiſely and powerfully, than in *the great Fountain of power, wiſdom, and animation.*

If chance could be ſuppoſed to produce a regular determined action, yet it is beyond the higheſt degree of credulity, to ſuppoſe it could continue this regularity for any time. But we find it remains through life independant of our will; and the ſame inceſſant vital actions have been carried on from the commencement of the world. It is thus that the ſun's influence upon the earth hath ever been regular. The production of trees, plants, and herbs, hath ever been uniform. Every ſeed produces now the ſame fruit it ever did. Every ſpecies of animal life is ſtill the ſame.—Could chance continue *this regular arrangement?* Could any thing continue it but the hand of an omnipotent Creator?

MENTAL STIMULI.

SECT. XVIII.

OF VISION.

WHEN the ſun riſes on the face of the earth, *all nature* ſeems to have received *a new creation.* What *majeſty!*—What *ſplendour!*—What *beauty!*

We will attempt, in as familiar a manner as poſſible, to explain to the attentive reader, *the nice mechaniſm* by which the ſight is thus capable of communicating to the mind theſe *lively*, *varied*, and *abundant perceptions*.

In relation to the following law, "*that the rays of light are refracted* (or turned inwards) *according to the denſity of the medium through which they paſs,*" our eyes conſiſt of 3 *diſtinct humours* of *different denſities*, each lodged in a tranſparent capſule, viz.

1. The EXTERNAL, or AQUEOUS;
2. The CENTRAL, or CRYSTALLINE; and
3. The INWARD, or VITRIOUS.

Becauſe light is ſubjected alſo to another law, the law of *reflection*, a DARK MEMBRANE lines the whole of the inſide of the globe.

The OPTIC NERVE expands itſelf over the concave bottom of this darkened ſphere, whoſe fibres, in a collected body, terminate obliquely[*] in the brain.

At the fore part of the eye there is, as it were, a *partition*, in the center of which a round orifice, called the PUPIL[†], is ſeen, which contracts or dilates itſelf, to admit of more or a leſs degree of light, by means of the muſcular fibres of the IRIS or UVIA[‡].

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[*] This might be adduced as a beautiful illuſtration of the beneficent intention of THE DIVINE ARCHITECT. A vein and artery accompany this nerve, ſo that when an object ſtrikes upon it, ſight is prevented. From the obliquity of the entrance of the optic nerve this does not often happen, but may be made to appear, if you form a dark ſpot on a piece of paper, and ſhutting one eye, turn this paper about, until the ſpot ſtrikes on the trunk of the vein covering the optic nerve, when it will immediately diſappear.

[†] This is the *ſmall black circle* in the middle of the eye.

[‡] Called *uvia*, from its ſuppoſed reſemblance to a grape, being uſually grey or black. This part is ſurrounded *externally* by the white of the eye, and *internally* by the pupil. The iris or uvia of a greyhound being put into an alkaleſcent mixture by Dr. Haighton, the *longitudinal fibres* were rendered viſible. Theſe *ſympathize* with the optic nerve: for in gutta ſerena, or decay of energy in that nerve, the pupil remains unaltered in dimenſions, however the light may vary. The *ſympathy* of parts was before ſhewn, when diſcourſing on the ſynchronous action of the oppoſite ſides of the heart, and is alſo diſplayed, when we irritate the noſtrils, and excite into action the muſcles of expiration, or when exciting the ſtomach by an emetic, the abdominal muſcles, to favour each rejection, are thrown into convulſive efforts.

Six muſcles * are placed behind, ſo as to turn this beautiful and uſeful organ on every ſide.

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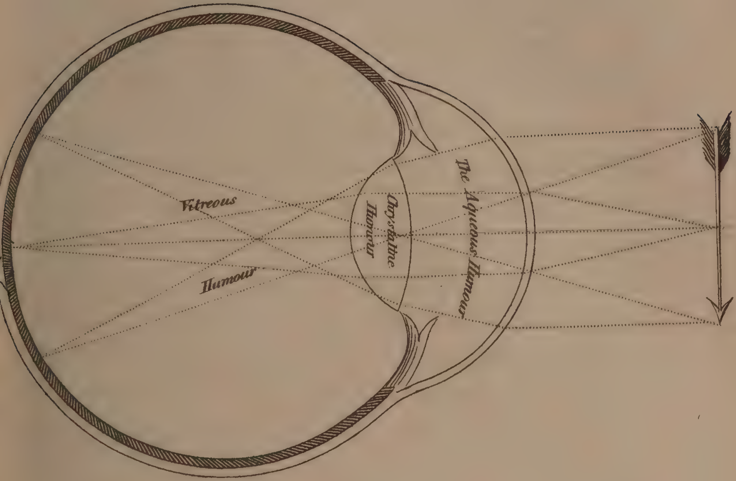
* The four right muſcles ariſe near together from the bottom of the orbit, where the optic nerve enters, which they ſurround. The one lifts the eye directly upwards, another turns it downwards, a third draws the ſight toward the noſe, and the fourth turns it the contrary way. They terminate each in a broad, flat, and very white tendon, which covers all the fore part of the eye, up to the circle of the *cornea* (or outer convex capſule of the aqueous humour); and their white and ſhining tendons form that enamelled like part which ſurrounds the coloured circle, and which is, from its colour, named *the white of the eye*, or the *tunica albuginea*, as if it were abſolutely a diſtinct coat.

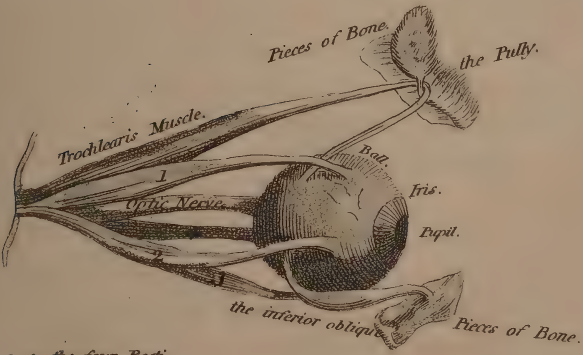
So perfectly balanced are theſe muſcles, that if they act all at once the eye is immoveably fixed. So that ſometimes in an operation, the eye is found more firmly ſet than it could be either by inſtruments or the finger.

The two oblique muſcles deſerve alſo particular attention. The inferior oblique ariſes from the orbit, and obliquely deſcends into that cavity to be inſerted under the eye-ball; and the ſuperior oblique, on the contrary, ariſes along with the recti muſcles, but ſends forth a long tendon, which paſſes through a ring near the noſe, and by this beautiful contrivance, it gets inſerted into the upper part of the eye-ball. They project the eye forward, as when we ſtrain to ſee diſtant objects.

Brutes have *another muſcle* not found in our eyes. A ſurgeon attempting to extract the cataract from the eye of a blind horſe, diſcovered this by accident, for as ſoon as the eye was touched, it receded deep into the head. This could be effected only by this *ſeventh* muſcle; which therefore ſeems to be provided for defending the eye, by drawing it thus into the orbit, in creatures who have no hand, like us, to ſkreen the eye upon the approach of danger.

Thus





1, 2, 3, 4. the four Recti,
or straight Muscles.

London Published by Cox & C°. March 1 1800.

Thus have we a perfect *camera obſcura*, with its different lenſes; and the image painted in the darkened chamber of the eye (owing to the reflection of the rays of light from the objects around), by affecting the optic nerve, preſents to the mind the varied and agreeable impreſſion.

Should it be inquired, "*in what way* the optic nerve conveys the image of the objects around; and whether this ariſes from *vibration*, or *the motion of ſome fluid?*" The anſwer is, it muſt be confeſſed, of very difficult ſolution. But it ſeems highly improbable that a *ſoft inelaſtic cord*, like a nerve, can *vibrate*, and no *inert heavy fluid* can *equal the quickneſs of perception*.

We are then induced, ſays the celebrated naturaliſt, Bonnet, to admit that there is a ſubtle fluid in the nerves, whoſe tenuity prevents our ſeeing it; and which ſerves alike for the propagation of ſenſible impreſſions, as muſcular motion. The *inſtantaneouſneſs* of this propagation, and *ſome other phenomena*, indicate that there is *a certain analogy* between *this fluid* and the *electric fluid* *.

As we know, indeed, that a ſixth part of the whole maſs of blood is driven to the brain from the heart in an *oxygenated* form, and quickly returns thence *unoxygenated* †, and is as ſpeedily ſupplied by freſh *oxygenated* blood, it was attempted to be proved that this quantity of blood, when paſſing into ſo ſmall an organ as the brain, could not be intended by frugal NATURE ſolely for nouriſhment, and the generation of vital heat, but moſt probably gave out its *oxygen* to be formed by the action of the brain into the *electric fluid.*

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* Vide Sect. on *Muſcular Motion.*

† Vide Sect. on the *Brain.*

As *the nerves* of ſight, and the other organs of ſenſe, terminate in the BRAIN, we have the higheſt reaſon to believe that the SOUL is ſeated there.

A ſubſtance, therefore, indifferent to motion and reſt, is related to a ſubſtance that thinks, and though unagitated by external impreſſion, can generally at will regain the former connexion. From this ſurpriſing bond there ſprings a reciprocal commerce between two diſtinct beings, a kind of action and reaction, which conſtitutes the life of organized ſentient beings.

The brain may therefore be compared to a *carte blanch*, receiving every impreſſion; and to a *cabinet*, wherein the different portions of the univerſe are painted in miniature, and may be drawn out at pleaſure.

SECT. XIX.

OF HEARING.

As we ſaw different humours in the eye in relation to the laws of light, ſo we find a no leſs complicated ſtructure of the ear in reference to the vibrations of the air. The uſes, however, of the ſeveral parts forming the ear is not ſo well underſtood: but it behoves us, in contemplating the work of THE CREATOR, not to queſtion the utility of any part; but to ſay, we find it here in this particular form, and therefore it muſt have its uſe.

The tremulous motions of the air are firſt received by the external ear. In men this part is much flatter than in brutes, but formed with certain folds, or inequalities, conſtituting a kind of winding paſſage for the air into the canal, which leads to the internal part of the ear.

THIS CANAL by its form would probably invite inſects to make a lodgment in it, were it not defended by a tenacious and bitter ſubſtance, called the wax of the ear. But in birds, whoſe organs of hearing are ſufficiently defended, no ſuch ſecretion is obſerved.

Through this canal the pulſations of the air are conveyed to a membrane, called *membrana tympani*, ſtretched acroſs it, and dividing the *external,* from what is called by anatomiſts, the *internal ear.*

From the tympanum, or drum, is an opening into the mouth. On one ſide of this paſſage, called *the Euſtachean tube,* there is a cartilage, to which there is affixed a muſcle, by which the paſſage may be varied, juſt as the muſcular fibres of the uvia vary the dimenſion of the pupil for the admiſſion of light. This opening is of ſo much importance towards hearing, that thoſe who are in ſome meaſure deaf, are generally obſerved to open their mouths when they liſten, whereby the vibrations of the air have a freer paſſage to the tympanum *.

Within the tympanum are lodged *four ſmall bones* ſubſervient to the office of hearing. Theſe communicate with certain *bony* and *winding cavities* † lined on their inſide with *nervous filaments,* which go to the brain by a common trunk.

It is generally believed, that the *tympanum* of the ear vibrates mechanically, when expoſed to audible ſounds, like the ſtrings of one muſical inſtrument, when the ſame notes are ſtruck upon another. Nor does this opinion ſeem improbable, as the muſcles and bones of the ear ſeem adapted to increaſe or diminiſh the tenſion of the tympanum for the purpoſes of mechanical vibrations.

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* The charming contrivance for preventing the food from paſſing into the wind-pipe by means of a flexible covering, was before obſerved, and we may remark here a no leſs kind intention in Providence towards man in furniſhing him with *the uvula,* which, as the food is paſſing into the œſophagus, is drawn back, and cloſes the opening into the noſe and Euſtachean tube. Animals who are prone, not being ſubject to have any of their aliment paſs through the noſe, want therefore this defence.

† To wit, the *veſtibulum, ſemicircular canals, and cochlea.*

But it appears from diſſection, that *the tympanum* *

is

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* The ſituation of the *membrana tympani* is nearly horizontal in men and in brutes, which is the beſt poſition to receive ſounds reverberated from the earth. In them it is *concave* outward; but in birds it is *convex* outward, ſo as to make the upper part of it nearly perpendicular to the horizon, which is beſt fitted for receiving of ſounds in the air. This membrane does not entirely cloſe the paſſage, but has, ſays Cheſelden, on one ſide a ſmall aperture covered with a valve. I found it, ſays he, once half open in a man that I diſſected, who had not been *deaf*; and I have ſeen a man ſmoak a whole pipe of tobacco through his ears, which muſt go from the mouth, by the paſſage of the Euſtachean tube, through the tympanum; et this man *heard* perfectly well. Theſe caſes occaſioned me to break the tympanum in both ears of a dog, and it did not deſtroy his hearing, but he was much ſhocked at any loud ſounds. In very young children I have always found this membrane covered with a *thick mucus*, which ſeems kindly provided for them, to prevent loud ſounds from affecting them too much. A gentleman well known in this city, having had *four* children born deaf, was adviſed to lay bliſters behind the ears of the next children he might have, which he did to *three* which were born afterwards, and every one of theſe heard perfectly well. It ſeemed not unreaſonable to ſuppoſe that too great a quantity of this mucus upon the drum, or the depoſition of coagulable lymph thrown out by inflammation, might be the cauſe of deafneſs in the four children, and that the diſcharge made by the bliſters in the three latter caſes,

was

is not the immediate organ of hearing, but that like *the humours of the eye*, it is only of uſe to *prepare* the object for the immediate organ. For *the auditory nerve* is not ſpread upon the tympanum, but upon the *veſtibulum*, and *cochlea*, and *ſemicircular canals* of the ear; while between the tympanum and the expanſion of the auditory nerve, the cavity is ſaid by Dr. Meckel, to be filled with *water*; as he had frequently obſerved by freezing the heads of dead animals before he diſſected them; and water being a more *denſe fluid* than air, is much better adapted to the propagation of vibrations.

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was the cauſe of their eſcaping the ſame misfortune. From theſe, and other like caſes, it may be concluded, that the *membrana tympani*, though uſeful in hearing, is not the ſeat of that ſenſe; and if any diſeaſe in that membrane ſhould obſtruct the paſſage of ſounds to the internal parts of the ear, which are the ſeat of that ſenſe, an artificial paſſage through that membrane might recover hearing, as the removing the *cryſtalline humour*, when that obſtructs the light, recovers ſight Some years ſince a malefactor, who was deaf, was pardoned on condition that he ſuffered this experiment. As ſoon as this was publicly known, Mr. Cheſelden, the lecturer on anatomy and ſurgery, and ſurgeon of St. Thomas's Hoſpital, was hooted and inſulted in the ſtreets, and having entered the theatre, the play was arreſted by the cry of DRUM! DRUM! and he was obliged to leave the theatre, ſo violent at all times has been the indignation againſt men, who are inclined, from a philoſophic conviction of truth, to *innovate*, or rather I might ſay, to *improve* the routine of things, and he was conſtrained by the public voice to deſiſt from the attempt, and it is probable that the world will loſe for ever the benefits that might have reſulted from this experiment!

I ſhall not expatiate on *theſe recluſe parts*; only there is one ſpecial contrivance of the nerves miniſtering to this ſenſe of hearing, which I think ought not to be paſſed by. One of the branches of the auditory nerves is diſtributed partly to the muſcles of the *ear*, partly to the *eye*, partly to the *tongue* and inſtruments of *ſpeech* *, and inoſculated with the nerves that go to the *heart* and *breaſt*. By which means there is an admirable and uſeful *conſent* between theſe parts of the body; it being natural for moſt animals, upon hearing any ſtrange ſound, to erect their ears, to open their eyes, and to be ready with the mouth to call out, or utter what the preſent occaſion ſhall dictate. And accordingly it is very common for moſt animals, when ſuddenly ſurpriſed in ſleep with any loud noiſe, preſently to ſhriek and cry out, and diſplay a great palpitation of the heart.

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* Every one in his childhood has repeatedly bit a part of the glaſs or earthen veſſel, in which his food has been given him, and has thence had a very diſagreeable ſenſation in the teeth, which ſenſation was deſigned by nature to prevent us from exerting them on objects harder than themſelves. The jarring ſound produced between the cup and the teeth is always attendant on this diſagreeable ſenſation: and ever after, when ſuch a ſound is accidentally produced by the conflict of two hard bodies, we feel by aſſociation of ideas, the concomitant diſagreeable ſenſation in our teeth. Others have, in their infancy, frequently held the corner of a ſilk handkerchief in their mouth, whilſt their companions in play have plucked it from them, and have given another diſagreeable ſenſation to their teeth, which has afterwards recurred on running the finger along thoſe materials. Dr. DARWIN.

A conſent of parts may alſo exiſt, where the nerves cannot be traced as connected together.

Hearing is a ſenſe much more neceſſary to man than to animals. With theſe it is only a warning againſt danger, or an encouragement to mutual aſſiſtance. In man, it is the ſource of moſt of *his pleaſures*; and without which his reaſon would be of little benefit.

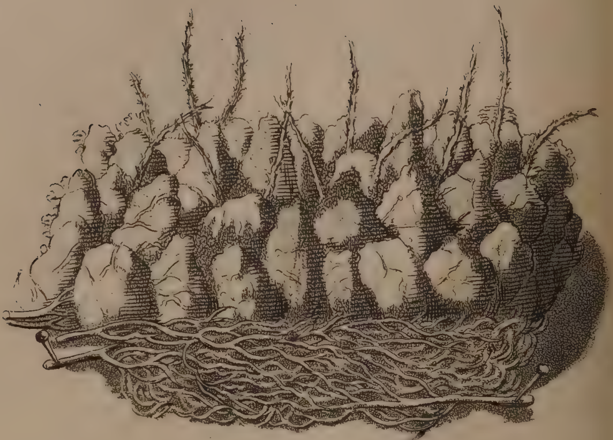
A man born deaf muſt neceſſarily be dumb; and his whole ſphere of knowledge will in all probability be bounded only by ſenſual objects. We have an inſtance of a young man, who, being born deaf, was reſtored, at the age of twenty-four, to perfect hearing: the account is given in the Memoirs of the Academy of Sciences, 1703.

A young man of the town of Chartres, between the age of twenty-three and twenty-four, the ſon of a tradeſman, and deaf and dumb from his birth, recovered his hearing, and in three months, by unremitting diligence, he underſtood what was ſaid to him, and could join tolerably well in converſation. Soon after, ſome divines queſtioned him concerning his ideas of his paſt ſtate; and principally with reſpect to God, his ſoul, and the morality and turpitude of actions. The young man, however, had not driven his ſolitary ſpeculations into that channel. He had gone to maſs, indeed, with his parents, had learned to ſign himſelf with the croſs, to kneel down and aſſume all the grimaces of a man that was praying; but he did all this without any manner of knowledge of the intention or the cauſe; he ſaw others do the like, and that was enough for him; he led a life of pure animal inſtinct; entirely taken up with ſenſible objects, and ſuch as were preſent, he did not ſeem even to make ſo many reflections upon theſe, as might reaſonably be expected from his ſituation: and yet the young man was not in want of underſtanding; but the underſtanding of a man deprived of all commerce with others, is ſo very confined, that the mind is in ſome meaſure totally under the control of its immediate ſenſation.

Every country has its martial muſic, which is either marches, imitations of battles, or lamentations for the cataſtrophes of war, and the fall of chiefs. Theſe ſtrains, though often rude and untutored, ſeize the imagination in a high degree. The march is generally in regular meaſure, ſometimes ſlow, and at other times lively and quick. The muſic, in imitation of battles, is conſtantly in every country wild, and abrupt in its tranſitions from interval to interval, and from key to key; various and deſultory in its movements; frequently irregular in the return of its cadences; and, in ſhort, through the whole, ſeems inſpired with ſuch fury and enthuſiaſm, that the hearer is irreſiſtibly infected with all the rage of precipitate courage, however rude may be the accents by which it is kindled.

All nations, even the moſt barbarous, have their inſtruments of *muſic*; and what is remarkable, the proportion between their notes is in all the ſame as in ours. This, however, is not the place for entering into the nature of theſe ſounds, their effects upon the air, or their conſonances with each other. We are not now giving an hiſtory of ſound, but of human perception.

All countries are pleaſed with *muſic*; and, if they have not ſkill enough to produce *harmony*, at leaſt they ſeem willing to ſubſtitute *noiſe*. Without all queſtion, noiſe alone is ſufficient to operate powerfully on the ſpirit; and if the mind be already prediſpoſed to joy, I have ſeldom found noiſe fail of increaſing it into rapture. The mind feels a kind of diſtracted pleaſure in ſuch powerful ſounds, braces up every nerve, and riots in the exceſs. But, as in the eye, an immediate gaze upon the ſun will diſturb the organ; ſo, in the ear, a loud, unexpected noiſe diſorders the whole frame, and ſometimes diſturbs the ſenſe ever after.



The Papillæ of the Finger as seen through a Microscope.

Warner del et sculp

London Published by Cox, & C^o. March 1-1800.

SECT. XX.

OF THE TOUCH.

The peculiar organ of this ſenſe is *the ſkin*, which covers the whole body, it being needful that the ſurface ſhould be provided with this ſenſe, that nothing might come into contact with any part of our body, without being perceived.

If we conſider the ſkin only, and reflect how accurately the mind diſtinguiſhes each particular portion, which is preſſed by the ſeveral parts of any object, how ſurpriſing muſt it appear, that the nerves we find aſſigned to the ſkin, can ſupply ſuch numbers of ſeparate fibres, as are neceſſary for diſtinguiſhing in this manner the action upon each almoſt infinite minute part of ſo very extended a ſurface!

As one office of the ſkin is to be an emunctory, by which the redundancies or effete parts of the blood are thrown forth; for this end it is furniſhed with numerous pores in every part of it. But between theſe pores ariſe, from the external ſurface of the ſkin, NERVOUS PAPILLÆ, very minute and contiguous to each other, by which the office of touch is performed.

Theſe are defended by *a mucous ſubſtance** ſpread *between* the *external* and *internal ſkin*, which being every where pierced through by *theſe papillæ*, receives the name of RETE MUCOSUM.

Beſides the pain conſequent upon injuries done to the ſkin, the primary object of ſenſation in theſe *papillæ* ſeems to be *hardneſs* and *ſoftneſs* : ſuch bodies as give way to the touch, we call *ſoft*; others, which reſiſt preſſure, ſo as to cauſe the ſkin to yield under them, we call *hard*. And how happily is this ſenſe tempered between the two extremes; being neither too acute nor too obtuſe!

By the touch, we correct the error of viſion. Naturally every object we ſee appears to be within our reach, for a child, who has yet made but little uſe of his ſenſe of feeling, would equally graſp at the moon as at objects within his reach. Mr. Cheſelden, having couched a boy of thirteen for a cataract, who had hitherto been blind, and having thus at once reſtored him to ſight, has curiouſly marked the progreſs of his recovery. He was, at firſt, couched only in one of his eyes; and when he ſaw for the firſt time, he was ſo far from judging of diſtances, that he ſuppoſed his eyes *touched* every object that he ſaw, in the ſame manner as his hands might be ſaid to feel them. It may be for this reaſon that we often ſee horſes frighted at things, which they have not become acquainted with by means of their noſtrils, which ſerve them in ſome reſpects like our hands. The whiſkers in animals ſerve them to meaſure apertures through which they have to paſs.

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* This gluey matter, ſoon after birth, grows of a *yellow tinge*, which increaſes in our riper age. It is *darker*, as the climate is hot, and as we become more expoſed to it, and under the line it is of a perfect *black colour*, forming the chief contraſt between *black* and *white* men. Dr. Beddoes, in the preſence of ſome pupils who attended his chemical lectures at Oxford, having directed a *black* to immerſe his hand in diluted oxygenated marine acid, the hand quickly became milky *white*; but the piebald negro reſiſted any further attempts. On the contrary, a French phyſician, it is ſaid, by giving a reverend divine ſilver diſſolved in the nitrous acid, converted him wholly into a *black*. Vide Dr. Beddoes' Works, and La Medicne Eclairée par les Sciences.

It has been remarked, that even brutes are intelligent in proportion to the accuracy of their feeling, or as their extremities approach in reſemblance to the human hand. The horſe and the bull, whoſe feet are covered with callous hoofs, are leſs intelligent than the dog, and the dog is inferior in acuteneſs to the ape, who poſſeſſes a rude kind of hand.

This ſenſe is the peculiar amuſement of infants, and, as we before obſerved, perfects the ſenſe of viſion.

SECT. XXI.

OF THE SENSE OF PAIN.

BUT different from this, and conſtituting another ſpecies of *feeling*, are thoſe ſenſations ariſing from different diſturbances in the animal machine.

All theſe various ſenſations are ſo diſtinct one from another, that ſcarce any two parts of the body feel the ſame ſpecies of pain. The *head-ach*, *tooth-ach*, *ear-ach*, though ranged under one general name, are yet very different kinds of ſenſation. The pain which the *bowels* feel in cholics, is totally different from any of theſe; and the affection of the ſtomach, called *ſickneſs**, is peculiar to that part, this organ being liable to other ſpecies of pain alſo. Again, the pain felt *in the breaſt* from the breath being ſtraitened, has no kind of analogy with any of theſe, the breaſt being alſo ſubject to other pains, inflammation and the like. Nor are the ſeveral modes of pain, to which our periſhing bodies are ſubject in all their diverſe parts, eaſily to be enumerated. But theſe variations principally merit our attention, as the different ſenſations of pain the ſame parts are ſubject to, may, ſo far as they can be deſcribed, point out the cauſe of each, and direct to the proper methods for removing them.

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* *Sickneſs* ariſes from *ſenſation*: hence it is always preceded by *nauſea*. Van Swieten relates that Sydenham was once ſick on ſeeing a putrid dead dog; coming paſt the ſame place *many years* afterwards, he felt a ſimilar inclination to vomit. Hence if we cut the par vagum, the nerve leading to the ſtomach, no ſickneſs can be excited in the dog by the moſt violent emetics.

Pain always *ſtimulates* in proportion to its intenſity and the ſenſiblity of the part affected, and accordingly theſe convey their impreſſion to the ſenſorium, which has a power even to ſtifle a part of the ſtimulus by reſignation, or elſe add to it by the impatience of the will.

SECT. XXII.

OF THE SENSATION OF HEAT AND COLD.

THERE are many experiments in chemical writers, that evince the exiſtence of HEAT *as a fluid element*, which covers and pervades all bodies, and is *attracted* by the *ſolutions* of ſome of them, and is *detruded* from the *combination* of others. Thus from the *combinations* of metals with acids, and from thoſe *combinations* of animal fluids which are termed ſecretions, *this fluid matter of heat* is given out amongſt the neighbouring bodies; and in the *ſolutions* of ſalts in water, or of water in air, it is *abſorbed* from the bodies that ſurround them; *whilſt in its facility in paſſing through metallic bodies, and its difficulty in pervading reſins and glaſs, it reſembles the properties of the electric aura; and is like that excited by friction, and ſeems like that to gravitate amongſt other bodies in its uncombined ſtate, and to find its equilibrium**.

There is no circumſtance of more conſequence in the animal œconomy than a due proportion of this fluid of heat; for the digeſtion of our nutriment, and the converſion of it into chyle in the bowels, and the proper qualites of all our ſecreted fluids, as they are produced partly by animal and partly by chemical proceſſes, depend much on *the quantity* of heat; the exceſs of which, or its deficiency, alike give us pain, and induces us to avoid the circumſtances that occaſion them.

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* Dr. DARWIN.

And in this the perception of heat eſſentially *differs* from the perceptions of the ſenſe of touch, as we receive pain from too much preſſure of ſolid bodies, but none from the abſence of it. It is hence conjectured that our CREATOR has provided us with *the nerve of touch*, as diſtinct in itſelf as the optic, or any other nerve of ſenſe, and *a ſet of nerves* for the reception of *this fluid*, which anatomiſts have not yet attended to.

There is another circumſtance which would induce us to believe, that the perceptions of heat and cold do not belong to the organ of touch; ſince *the teeth*, which are the leaſt adapted for the perceptions of ſolidity and figure, are the moſt ſenſible to heat or cold; whence we are forewarned from ſwallowing thoſe materials, whoſe degree of coldneſs or of heat would injure our ſtomachs.

The following is an extract from a letter of Dr. Darwin of Shrewſbury, when he was a ſtudent at Edinburgh, to his friend Dr. Darwin of Derby.

DEAR SIR,

I MADE an experiment yeſterday in the hoſpital, which much favours your opinion, "*that the*

the ſenſation of HEAT *and of* TOUCH *depend on different ſets of nerves.*"

A man who had lately recovered from a fever, and was ſtill weak, was ſeized with violent cramps in his legs and feet; which were removed by opiates, except that one of his feet remained inſenſible.

Dr. Ewart pricked him with a pin in five or ſix places, and the patient declared he did not feel it in the leaſt, nor was he ſenſible even of a very ſmart pinch.

I then held a *hot iron* at ſome diſtance, and brought it gradually nearer and nearer, till it came within three inches, when he aſſerted he felt it quite diſtinctly.

I have the honour to be, &c. &c.

A gentleman, a patient of the author's [*], had a paralytic ſtroke. He loſt his feeling on one ſide and retained his muſcular powers, and on the other he retained his feeling, and was deprived of all uſe of his limbs. A ſimilar caſe is recorded by Dr. Falconer in his hiſtory of the Bath Waters. Does not this caſe ſeem to imply two diſtinct ſets of nerves [†]?

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[*] Mr. Kirkman of Broad-ſtreet.

[†] This ſubject deſerves to be more particularly conſidered by both the anatomiſt and phyſiologiſt.

SECT.

SECT. XXIII.

OF SMELLING.

THE infinitely ſmall particles that are continually detached from the ſurface of odoriferous bodies, float in the air, which tranſports them every where, and being drawn into the noſtrils by the breath, are applied to the membrane that is diſtributed in the bony cavity in the inſide of the noſe. *This membrane* is totally covered with infinite ramifications, and convolutions of the *olfactory nerves*.

The great CREATOR, ever attentive to the eaſe and convenience of his creatures, has furniſhed the noſtrils with a number of *glands*, or ſmall arteries, which ſecrete a thick mucus, which defends the nerves from the ſlighter action of the air, or the too powerful ſtimulus of acrid odours.

Of all the ſenſes, perhaps, there is not one in which man is more inferior to other animals than in that of *ſmelling*. A dog ſcents various kinds of game at conſiderable diſtances; and, if the fact were not confirmed by daily experience, it could hardly gain credit, that he can trace the odour of his maſter's foot through all the winding ſtreets of a populous city!

In the ſelection of food, men are greatly aſſiſted, even in the moſt luxurious ſtate of ſociety, by the ſenſe of ſmell. By *ſmelling* we often reject food as noxious, and will not riſk the other teſt of taſting. Victuals, which have a putrid ſmell, as equally offenſive to our noſtrils as hurtful to our conſtitution, we avoid with abhorrence; but we are allured to eat ſubſtances which have a grateful and ſavoury odour. The more frequent and more acute diſcernment of brutes in the exerciſe of this ſenſe is chiefly owing to their freedom, and to their uſing natural productions alone. But men in ſociety, by the arts of cookery, by the unnatural aſſemblage of twenty ingredients in one diſh, blunt, corrupt, and deceive, both their ſenſes of *ſmelling* and of *taſting*.

It is not unworthy of remark, that, in all animals, the organs of *ſeeing*, *ſmelling*, and *taſting*, are uniformly ſituated very near each other. Here the intention of NATURE is evident. The vicinity of theſe three ſenſes form a *triple* guard in the ſelection of food.

But aſſiſtance in the choice of food is not the only advantage that men and other animals derive from the ſenſe of *ſmelling*. When our ſenſes are not vitiated by unnatural habits, they are not only faithful monitors of danger, but convey to us the moſt exquiſite *pleaſures*. The fragrance of a roſe, and the perfume of many other flowers, is not only pleaſant, but gives a refreſhing and delightful *ſtimulus* to the whole ſyſtem, and may be conſidered therefore often as a ſpecies of wholeſome excitement.

SECT. XXIV.

OF TASTE.

The ſmell, as was before obſerved, has great connexion with the taſte. We often are directed by it in judging of our food; and that part of taſte which we uſually call *flavour*, is a mixed kind of ſenſation compounded after ſome manner from both. By the communication between the noſe and mouth, the olfactory nerves ſeem capable of being affected that way; inſomuch, that perſons who are at the pains to prevent the acceſs of air by the noſtrils, ſwallow nauſeous draughts without taſting them.

The guſtatory nerves, by which this ſenſation is received, riſe upon the body of the *tongue* in a manner ſomewhat ſimilar to thoſe in the ſkin; for PAPILLÆ more viſible than thoſe of the ſkin (otherwiſe alike) appear in thoſe parts of the tongue that are endued with this ſenſe. *Theſe* are always erected on the application of ſapid or ſtimulating ſubſtances. This elevation and extenſion of the *papillæ*, by bringing larger portions of the nerves into contact with the ſubſtances applied to the tongue, give additional ſtrength to the ſenſation, and enable us to judge with greater accuracy concerning their nature and qualities. The *ſaliva*, which perpetually moiſtens the tongue, is a liquor which, though inſipid itſelf, is found in all animals to be a very powerful ſolvent. Every ſubſtance applied to the tongue is partially diſſolved by the ſaliva before the ſenſation of taſte is excited. And hence when the tongue is rendered dry by diſeaſe, or any other cauſe, the ſenſe of taſte is either vitiated or totally deſtroyed.

The ſenſes of *ſmell* and *taſte* in many other animals greatly excel thoſe of mankind, for in civilized ſociety, as our victuals are generally prepared by others, and are adulterated with ſalt, ſpice, oil, and empyreuma, *we* do not heſitate about eating whatever is ſet before us, and neglect to cultivate theſe ſenſes: whereas *other animals* try every morſel by the *ſmell*, before they take it into their mouths, and by the *taſte* before they ſwallow it; and are led each to his proper nouriſhment by his organs of ſenſe.

Nevertheleſs we may obſerve that *children*, having abundant excitability, are naturally inclined towards thoſe foods which contain but little ſtimuli. And, on the contrary, *thoſe* who are *more advanced in life*, and whoſe excitability is blunted, are fond of the moſt poignant diſhes. Every one muſt remember how great a pleaſure he found in ſweets and milk while a *child*. As he *grew older* he inſenſibly calls to his aſſiſtance ſpices, ſalts, and aromatics; and delights in thoſe taſtes which in childhood he was unable to endure.

SECT XXV.

OF IMAGINATION.

An animal may be ſaid to fill up that ſphere which he can reach by his ſenſes; and is actually large in proportion to the ſphere to which its organs extend. By *ſight*, man's enjoyments are diffuſed into a wide circle;—that of *hearing*, though leſs widely diffuſed, nevertheleſs extends his powers;—the ſenſe of *ſmelling* is more contracted ſtill;—and the *taſte* and *touch* are the moſt confined of all. Thus man enjoys *very diſtant objects*, but with *one ſenſe only*; more *nearly* he brings *two ſenſes* at once to bear upon them; his ſenſe of *ſmelling* aſſiſts *the other two*, and at its own diſtance.

Each ſenſe, however, the more enlarged its ſphere, the more capable it is of making *combinations*; and is, conſequently, the more *improveable.* Refined imaginations, and men of ſtrong minds, take more pleaſure, therefore, in improving the delights of the *diſtant ſenſes* than in enjoying ſuch as are ſcarce capable of improvement.

By combining *the objects* of the *extenſive ſenſes*, all the arts of poetry, painting, and harmony, have been diſcovered; but the *cloſer ſenſes*, if I may ſo call them, ſuch as ſmelling, taſting, and touching, are, in ſome meaſure, as ſimple as they are limited, and admit of little variety. *The man* of *imagination* makes a great and an artificial happineſs, by the pleaſure of *altering* and *combining*; the *ſenſualiſt* juſt ſtops where he began, and cultivates only thoſe pleaſures which he cannot improve. The *ſenſualiſt* is contented with thoſe enjoyments that are already made to his hand; but *the man* of *refined pleaſure* is beſt pleaſed with happineſs of his own creating.

SECT. XXVI.

OF THE PASSIONS.

THE effect of different PASSIONS on the *voluntary* as well as *involuntary organs*, is a ſubject worthy of ſcrutiny, and has not been enough attended to by the phyſiologiſt. *Hope*, *fear*, *joy*, *grief*, are well known to diſplay their ſigns externally. The character of each man can in general be read in his face. Diſſocial paſſions, being hurtful by prompting violence and miſchief, are noted by the moſt conſpicuous external ſigns, in order to put us upon our guard: thus *anger* and *revenge*, eſpecially when ſudden, diſplay themſelves on the countenance in the moſt legible characters. The breathing is quick, with deep inſpirations; hence the ſwelling of the noſtrils, and projecting of the under lip; the accumulated nervous electricity now paſſes the GANGLIONS, which nature deſigned as *barriers* in the more tranquil hour, and flies to the heart, which propels with velocity the blood, which being very deeply *oxygenated* in its quick tranſit through the lungs, aids muſcular exertion, inflames the eye, and reddens the countenance. The other internal viſcera are alſo affected, and there is a ſuffuſion of bile. In *fear* there is a deep inſpiration, and it is long before the air vitiated in the lungs is returned, the mouth is wide gaping, the noſtrils cloſed and the heart receiving *unoxygenated* blood palpitates, the countenance is livid, the hands pale, and ſwooning often enſues. The ſerpents in Africa, according to Vaillant, fix their eyes on a bird, and curling themſelves up, ſo terrify theſe little creatures, that they are incapable of flight, and fall down from the buſh or tree dead. *Sorrow* produces nearly the ſame inattention to reſpiration; hence the noſtrils are drawn downwards, the mouth is half open for languid reſpiration, ſighs are frequent, the face is of a lead colour, and the lips are pale. We ſhall not enter *now* more deeply into the queſtion, but conclude by obſerving, that the *external ſigns* of paſſion are a ſtrong indication that man, by his very conſtitution, is framed to be open and ſincere. A child, in all things obedient to the impulſes of nature, hides none of its emotions; the ſavage and clown, who have no guide but pure nature, expoſe their hearts to view, by giving way to all the natural ſigns. And even when men learn to diſſemble their ſentiments, and when behaviour degenerates into art, there ſtill remains checks, that keep diſſimulation within bounds, and prevent a great part of its miſchievous effects. The total ſuppreſſion of the voluntary ſigns during any vivid paſſion, begets the utmoſt uneaſineſs, which cannot be endured, but by the moſt practiſed villains. We may pronounce therefore, that *nature*, herſelf ſincere and candid, intends that mankind ſhould

preſerve

preſerve the ſame character, by cultivating ſimplicity and truth, and baniſhing every ſort of diſſimulation that tends to miſchief.

I believe an attempt to ſet forth all the Emotions of the mind, and their Effects on the animal œconomy, would be a work extremely acceptable to the majority of readers: but our preſent taſk is only to conſider ſome few emotions; though the variety of theſe is great, and worthy in every branch of that variety of an attentive inveſtigation. The more accurately we ſearch into the *human mind*, the ſtronger traces we ſhall every where find of HIS wiſdom who made it. If a diſcourſe on the uſe of the parts of the body may be conſidered as an hymn to the CREATOR; the uſe of the *paſſions*, which are the organs of the mind, cannot be barren of praiſe to HIM, nor unproductive of that union of ſcience and admiration to ourſelves, which a contemplation of the works of INFINITE WISDOM can alone afford to a rational mind; whilſt, referring to HIM whatever we find of right, or good, or fair, in ourſelves, diſcovering HIS ſtrength and wiſdom in our own weakneſs and imperfection, honouring them where we diſcover them clearly, and adoring their profundity where we are loſt in our ſearch, we may be inquiſitive without impertinence, and elevated without pride; we may be admitted, if I may dare ſay ſo, into the counſels of the ALMIGHTY by a conſideration of his works.

The *elevation* of the *mind* ought to be the principal end of all our ſtudies. Whatever turns the ſoul inward on itſelf, tends to concenter its force, and to fit it for greater and ſtronger flights of ſcience. By looking into phyſical cauſes, our minds are opened and enlarged; and in this purſuit, whether we take, or whether we loſe our game, the chace is certainly of ſervice. If we can direct the lights we derive from ſuch ſpeculations, whilſt we inveſtigate as far as poſſible the ſprings, and trace the effects of our *emotions*, we may not only communicate to the taſte a ſort of philoſophical ſolidity, but we may *reflect back* on the *ſeverer ſciences* ſome of the *graces* and *elegancies of taſte*, without which the greateſt proficiency in thoſe ſciences will always have the appearance of ſomething *diſguſtful* and *illiberal*.

SECT. XVII.

OF ANGER.

Anger, in its operation on the animal œconomy, is one of the ſtrongeſt of the *mental ſtimuli.* It rouſes the heart and arteries into greater action, produces an ardent glow over the whole body, but more eſpecially in the face; the eyes look red, the voice is loud, and the muſcular powers are increaſed: hence gout, palſy, &c. have been all removed by violent paroxyſms of rage.

But this ſtimulus is uſually too active in its operation to be friendly to health.

Where revenge cannot be indulged, a paleneſs of the ſkin and cheeks quickly ſucceeds, the voice faulters, and the limbs are affected with tremor. But where the object is perpetually calling for reſentment, and this paſſion is not conſumed in violent action, it then gives tone to the muſcular fibre.

Upon the Britiſh fleet coming into the Bay of Hieres (February 1744), our men, ſays Mr. Ives, underſtood that the enemy's fleet and ours were ſoon to engage. There appeared, not only in the *healthy*, but alſo in the *ſick*, the higheſt mark of ſatisfaction and pleaſure, and *theſe laſt mended ſurpriſingly daily*, inſomuch that on the 11th of February, the day we engaged the combined fleets of France and Spain, we had not above four or five but what were at their fighting quarters.

The Philadelphia militia who joined the remains of General Waſhington's army, in December 1776, and ſhared with them a few days afterward, in the capture of a large body of Heſſians at Trenton, conſiſted of 1500 men, moſt of whom had been accuſtomed to the habits of a city life. Theſe men ſlept in tents and barns, and ſometimes in the open air, during the uſual colds of December and January; and yet there were only two inſtances of ſickneſs, and only one of death, in that body of men in the courſe of near ſix weeks, in thoſe winter months. This *extraordinary healthineſs* of ſo great a number of men, under ſuch trying circumſtances, can only be aſcribed to the vigour infuſed into the body from the ſtrong paſſions of the mind rendering the body inſenſible to the ordinary cauſes of diſeaſe.

Militia officers and ſoldiers. who enjoyed good health during the campaign, were often affected by fevers and other diſorders, as ſoon as they returned to their reſpective homes. I knew one inſtance, ſays Dr. Ruſh, of a militia captain, who was ſeized with convulſions the firſt night he lay at eaſe, after having ſlept ſeveral months on a mattraſs upon the ground. Theſe affections appear to have been produced only by the ſudden abſtraction of that tone in the ſyſtem which was excited by a ſenſe of danger, and the other invigorating objects of a military life.

The patience, firmneſs, and magnanimity, with which the officers and ſoldiers of the American army endured the complicated evils of hunger, cold, and nakedneſs, can only be aſcribed, continues this ſagacions phyſician, to an inſenſibility of body, produced by an uncommon tone of mind, excited by the love of *liberty* and the *hatred* of the enemy: for the war was carried on by the Americans againſt a nation, to whom they had long been tied by the numerous obligations of conſanguinity, laws, religion, commerce, language, intereſt, and a mutual ſenſe of national glory; the *reſentment* of the Americans roſe of courſe, as is uſual in all diſputes, in proportion to the number and force of theſe ancient bonds of affection and union. On this ſame principle it is, that ſavages, to ſatiate their revenge, bear with uncommon patience, and without injury, all the ſeverities of cold and hunger, and have been known to wait even eight or ten months in ambuſh to deſtroy an adverſary.

SECT. XXVIII.

ON ENTHUSIASM.

It is well known that perſons under ſtrong prepoſſeſſions of mind, have expoſed themſelves* to extreme bodily tortures without expreſſion of pain, and have alſo endured long faſtings, the extremities of heat and cold, the infection of contagious diſtempers, and other hazardous things without feeling the conſequences that would moſt probably have taken place, had not the nervous feelings been more forcibly pre-occupied.

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* Tolerantia inediæ atque algoris mirabilis. Boerhaav. Aphoriſm. 1120.

SECT. XXIX.

OF LOVE.

LOVE, the moſt univerſal and grateful paſſion of human nature, which, in general, neither aſſumes the violence of *anger*, nor ſinks into the depreſſion of *grief*, may be conſidered as a *temperate ſtimulus*; but in its viciſſitudes and extremes, it may acquire the impetuoſity of the *firſt*, or the deſpondency of the *latter*.

In *love*, in *propitious love*, the heart beats with joy; vivacity cheers the countenance, the eye is brilliant, ſociety is courted, language is animated, and vigour augmented.

But when this paſſion has taken deep poſſeſſion of the heart and ſoul, with a *dubious*, or *adverſe return*, it is expreſſed by deep involuntary ſighs; every incident that excites emotion, eſpecially the tender emotions of ſympathy, makes the heart palpitate, and ſuffuſes the face with faint bluſhes; the voice is low, languid, ſlow, or faultering; the eyes are downcaſt or penſive; and the breaſt heaves and falls, like the motion of gently diſturbed waters. Solitude, ſhades, and evening walks, are frequented; objects of pity are cheriſhed, and all the effuſions of ſentiment are tender, ſedate, and ſympathetic. The face at length becomes pale and wan, the eyes ſink, the appetite for food is obliterated, and frightful dreams invade the tedious night.

SECT. XXX.

OF SOCIAL AFFECTION.

THIS is the mildeſt and moſt agreeable of all the mental ſtimuli. It is this, ſays Lavater, which has ſweetened every bitter of my life; this has alone ſupported me, when the ſorrows of a wounded heart wanted vent. When my beſt endeavours were rejected, when the ſacred impulſe of conſcious truth was ridiculed, hiſſed at, and deſpiſed, the tear of ſorrow was ever wiped away by the gentle, tender, and affectionate addreſs of a female mind, who had an aſpect like that of unpractiſed, cloiſtered virginity, which felt, and was able to efface each emotion, each paſſion, in the moſt concealed feature of her huſband's countenance, and by endearing means, without what the world would call beauty, always ſhone forth in countenance *heavenly* as an angel.

Sweet is the breath of morn, her riſing ſweet,
With charm of earlieſt birds: pleaſant the ſun,
When firſt on this delightful land he ſpreads
His orient beams, on herb, tree, fruit, and flow'r,
Gliſt'ning with dew; fragrant the fertile earth
After ſoft ſhow'rs; and ſweet the coming on
Of grateful evening mild: then ſilent night,

With this her ſolemn bird; and this fair moon,
And theſe the gems of heav'n, her ſtarry train.
But neither breath of morn, when ſhe aſcends
With charm of earlieſt birds : nor herb, fruit, flow'r,
Gliſt'ning with dew : nor fragrance after ſhow'rs :
Nor grateful ev'ning mild : nor ſilent night,
With this her ſolemn bird : nor walk by moon ;
Or glitt'ring ſtar-light, WITHOUT THEE IS SWEET.

MILTON.

SECT. XXXI.

OF VIRTUE.

VIRTUE, the ſtrength and beauty of the ſoul,
It pleaſes and it laſts;—a *happineſs*
That even above the ſmiles and frowns of fate
Exalts great Nature's favourites: a *wealth*
That ne'er encumbers, nor to baſer hands
Can be transferr'd: it is the only good
Man juſtly boaſts of, or can call *his own.*
Riches are oft by guilt and baſeneſs earn'd;
Or dealt by chance, to ſhield a lucky knave,
Or throw a fairer ſunſhine on a fool.
But for one end, one much-neglected uſe,
Are riches worth your care: (for Nature's wants
Are few, and without opulence ſupplied.)
This noble end is, to produce *the ſoul*;
To ſhew the virtues in their faireſt light;
To make humanity the miniſter
Of bounteous Providence; and teach the breaſt
That *generous luxury* the good enjoy.
Oh! bleſt of heav'n, whom not the languid ſongs
Of luxury, not the inviting bribes
Of ſordid wealth, nor all the gaudy ſpoils
Of pageant honour can ſeduce to leave
Thoſe ever-blooming ſweets, which from the ſtore

Of Nature fair imagination culls
To charm th' enliven'd ſoul! *For him*, the ſpring
Diſtils her dews, and from the ſilken gem
Its lucid leaves unfolds: *for him*, the hand
Of Autumn tinges every fertile branch
With blooming gold, and bluſhes like the morn.
Each paſſing hour ſheds tribute from her wings;
And ſtill new beauties meet *his* lonely walk,
And loves unfelt attract him. Not a breeze
Flies o'er the meadow, not a cloud imbibes
The ſetting ſun's effulgence, not a ſtrain
From all the tenants of the warbling ſhade
Aſcends, but whence *his boſom* can partake
Freſh pleaſure, *unreproved*.—Or when lightnings fire
The arch of heav'n, and thunders rock the ground;
When furious whirlwinds rend the howling air,
And ocean, groaning from the loweſt bed,
Heaves his tempeſtuous billows to the ſky:
Amid the mighty uproar, while below
The nations tremble, he, *good man*, looks abroad,
From ſome high cliff, ſuperior, and *enjoys*
The elemental war.

ARMSTRONG.

SECT. XXXII.

OF HOPE.

THERE ſurely never was a greater number of cures aſcribed to one perſon, than thoſe, which were lately ſaid to have been wrought in France upon the tomb of Abbé Paris, the famous Janſeniſt, with whoſe ſanctity the people were ſo long deluded. The curing of the ſick, giving hearing to the deaf, and ſight to the blind, were every where talked of as the uſual effects of that holy ſepulchre. But what is more extraordinary, many of the miracles were immediately proved upon the ſpot, before judges of unqueſtioned integrity, atteſted by witneſſes of credit and diſtinction, in a learned age, and on the moſt eminent theatre that is now in the world. Nor is this all: a relation* of them was publiſhed and diſperſed every where; nor were the Jeſuits, though a learned body, ſupported by the civil magiſtrate, and determined enemies to thoſe opinions, in whoſe favour the miracles were ſaid to have been wrought, ever able diſtinctly to refute or detect them.

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* A book was written by Monſ. Montgeron, counſellor or judge of the parliament of Paris, a man of figure and character,

Where ſhall we find ſuch a number of circumſtances, agreeing to the corroboration of one fact?
And

ter, who was alſo a martyr to the cauſe. There is another book in three volumes (called *Recueil des Miracles de l'Abbé Paris)* giving an account of many of theſe miracles

Many of the miracles of Abbé Paris were proved immediately by witneſſes before the officiality or biſhop's court at Paris, under the eye of cardinal Noailles, whoſe character for integrity and capacity was never conteſted even by his enemies.

His ſucceſſor in the archbiſhopric was an enemy to the *Janſeniſts*, and for that reaſon promoted to the ſee by the court. Yet 22 rectors or *cures* of Paris, with infinite earneſtneſs, preſs him to examine thoſe miracles, which they aſſert to be known to the whole world, and indiſputably certain: but he wiſely forbore.

The *Moliniſt* party had tried to diſcredit theſe miracles in one inſtance, that of Mademoiſelle le Franc. But, beſides that their proceedings were in many reſpects the moſt irregular in the world, particularly in citing only a few of the *Janſeniſts'* witneſſes, whom they tampered with: beſides this I ſay, they ſoon found themſelves overwhelmed by a cloud of new witneſſes, one hundred and twenty in number, moſt of them perſons of credit and ſubſtance in Paris, who gave oath for the miracle. This was accompanied with a ſolemn and earneſt appeal to the parliament.

All who have been in France about that time have heard of the reputation of Monſ. Heraut, the *lieutenant de Police*, whoſe vigilance, penetration, activity, and extenſive intelligence, have been much talked of. This magiſtrate, who by the nature of his office is almoſt abſolute, was inveſted with full powers, on purpoſe to ſuppreſs or diſcredit theſe miracles; and he frequently ſeized immediately, and examined the witneſſes and ſubjects of them: but never could reach any thing ſatisfactory againſt them.

In

And what have we to oppoſe to ſuch a cloud of witneſſes, but the abſolute impoſſibility or miracu-
lous

In the caſe of Mademoiſelle Thibaut, he ſent the famous de Sylva to examine her; whoſe evidence is very curious. The phyſician declares, that it was impoſſible ſhe could have been ſo ill as was proved by witneſſes; becauſe it was impoſſible ſhe could, in ſo ſhort a time, have recovered ſo perfectly as he found her. He reaſoned, like a man of ſenſe, from natural cauſes; but the oppoſite party told him, that the whole was a miracle, and that his evidence was the very beſt proof of it.

No leſs a man than the Duc de Chatillon, a duke and peer of France, of the higheſt rank and family, gives evidence of a miraculous cure, performed upon a ſervant of his, who had lived ſeveral years in his houſe with a viſible and palpable infirmity.

I ſhall conclude with obſerving, that no clergy are more celebrated for ſtrictneſs of life and manners than the ſecular clergy of France, particularly the rectors or curés of Paris, who bear teſtimony to theſe cures.

The learning, genius, and probity of the gentlemen, and the auſterity of the nuns of Port-royal, have been much celebrated all over Europe. Yet they all give evidence for a miracle, wrought on the niece of the famous Paſcal, whoſe ſanctity of life, as well as extraordinary capacity, is well known. The famous Racine gives an account of this miracle in his famous hiſtory of Port-royal, and fortifies it with all the proofs, which a multitude of nuns, prieſts, phyſicians, and men of the world, all of them of undoubted credit, could beſtow upon it. Several men of letters, particularly the biſhop of Tournay, thought this miracle ſo certain, as to employ it in the refutation of atheiſts and freethinkers. The queen regent of France, who was extremely prejudiced againſt the Port-royal, ſent *her own phyſician* to examine the miracle,
who

lous nature of the events, which they relate? And this ſurely, in the eyes of all reaſonable people, will alone be regarded as a *ſufficient refutation.*

The ſiege of Breda, in the year 1625, affords an example almoſt equally ſtriking. "That city, from a long ſiege, ſuffered all the miſeries that fatigue, bad proviſions, and diſtreſs of mind could bring on its inhabitants. Among other misfortunes, the *ſcurvy* made its appearance, and carried off great numbers. This, added to the other calamities, induced the garriſon to incline towards a ſurrender of the place, when the Prince of Orange, anxious to prevent its loſs, and unable to relieve the garriſon, contrived, however, to introduce letters addreſſed to the men, promiſing them the moſt ſpeedy aſſiſtance. *Theſe were accompanied with medicines againſt the ſcurvy, ſaid to be of great price, but of ſtill greater efficacy*; *many more were to be ſent there. Three ſmall vials of medicine were given to each phyſician. It was publicly given out, that three or four drops were ſufficient to impart a healing virtue to a gallon of liquor.* We now diſplayed our wonder-working balſams. Nor even were the commanders let into the ſecret of the cheat upon the ſoldiers. They flocked in

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who returned *an abſolute convert.* In ſhort, the ſupernatural cure was ſo inconteſtable, that it ſaved, for a time, that famous monaſtery from the ruin with which it was threatened by the Jeſuits. Had it been a cheat, ſays Hume, it had certainly been detected by ſuch ſagacious and powerful antagoniſts, and muſt have haſtened the ruin of the contrivers.

crowds about us, every one who had the ſcurvy ſoliciting that ſome part might be reſerved for his uſe. Cheerfulneſs again appears in every countenance, and an *univerſal faith* prevails in the ſovereign virtues of the remedies. The effect of this deluſion was truly aſtoniſhing, *for many were quickly and perfectly recovered. Such as had not moved their limbs for a month before, were ſeen walking the ſtreets with their limbs ſound, ſtraight, and whole.* They boaſted of their cure by the Prince's remedy, the motion of their joints being reſtored by ſimple friction with oil, and the belly now of itſelf performed its office, or at leaſt with a ſmall aſſiſtance from medicine. Many, who had declared that they had been rendered worſe by all former remedies, recovered *in a few days* to their inexpreſſible joy, and the no leſs general ſurpriſe, by their taking what we affirmed to be their gracious *Prince's cure.* "*This curious relation,*" adds Dr. Lind *, "*would hardly perhaps gain credit, were it not in every reſpect conſonant to the moſt accurate obſervations, and beſt atteſted deſcriptions of that diſeaſe. It is given us by an eye-witneſs, an author of great candour and veracity, who, as he informs us, wrote down every day the ſtate of his patients, and ſeems more to be ſurpriſed with their unexpected recovery than he probably would have been, had he been better acquainted with the nature of this ſurpriſing malady. An important leſſon in phyſic,*" adds this excellent writer, " *is hence to be learned, the wonderful and powerful influence of the paſſions of the mind on the ſtate and diſorders of the body. This is too often overlooked in the cure of diſorders, many of which are ſometimes attempted by the ſole mechanical operation of drugs, without calling in to our aſſiſtance the ſtrong powers of the imagination, or the concurring influences of the ſoul. Hence it is, that the ſame remedy will not always produce the ſame effect, even in the ſame perſon, and that common remedies often prove wonderfully ſucceſsful in the hands of men not of the faculty, which do not anſwer the purpoſe in a timorous and diſtruſtful patient.*"

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* Lind on the Scurvy, p. 349.

SECT. XXXIII.

OF FEAR,

OCCASIONING EXERTIONS OF THE MIND.

IN chronic diſeaſes, as in hyſteria and hypochondriac patients, in perſons afflicted with aſthma, or with a fit of the gout, tooth-ach, ague, or rheumatiſm, I have known theſe ſeveral diſorders ſuſpended for a time, and often entirely cured, when the mind has been under the influence of fear, ſurpriſe, or rouſed to a fixed attention to ſome intereſting object.

I have frequently obſerved delicate hyſterical women, who, for many months, had ſeldom enjoyed one day's health, ſuddenly relieved from every complaint when a favourite child was attacked with a diſeaſe in which danger was apprehended, and they continued, in appearance, to be in perfect health during the whole courſe of the illneſs, and exhibited an unuſual alertneſs in diſcharging their duty as nurſes and as parents. But when they underſtood that the danger of the diſeaſe was over, their former complaints gradually returned, to their great ſurpriſe; for, from ſo complete a ſuſpenſion of their complaints as they had lately enjoyed, and for ſo conſiderable a time, they believed themſelves perfectly cured.

I have been alſo informed, from the beſt authority, that during the troubles in Scotland, in the years 1745 and 1746, hyſterical and nervous diſorders ſcarcely ever made their appearance.

A very remarkable inſtance of the influence the mind has upon diſorders of the body, occurred to the celebrated Boerhaave. A perſon fell down in an epileptic fit in the ſight of the other patients. The effect of this operated ſo ſtrongly, that great numbers of them became immediately affected in the ſame manner. The opinion of the great phyſician above mentioned was requeſted on this occaſion. He judiciouſly reflected, that, as theſe fits were originally produced by an impreſſion on the mind, that the moſt proper means of cure would be to eradicate theſe impreſſions by others ſtill more powerful. He therefore directed *actual cauteries* to be prepared, and kept hot, in readineſs to be applied to the perſon who ſhould next be affected. *The conſequence was, not one perſon was ſeized.*

A gentleman of great courage and honour, who had become valetudinary, and ſubject to the aſthma, by long ſervice in India, as an officer in the land forces, told me, he was attacked with a ſevere fit of that diſorder during their encampment, which uſually laſted from ten to twelve days: that, upon the third or fourth day of his illneſs, when he could only breathe in an erect poſture, and without mo-

tion,

tion, imagining that it was not in his power to move ſix yards to ſave his life, the alarm guns were fired for the whole line to turn out, becauſe a party of the Mahrattas had broke into the camp; and fearing certain death if he remained in his tent, *he ſprung out with an alacrity that amazed his attendants; inſtantly mounted his horſe, and drew his ſword with great eaſe, which the day before he could not move from its ſcabbard, though he had uſed his whole ſtrength in the attempt.* From the inſtant of the alarm and ſurpriſe, the *debility* left him, together with the *aſthma*; nor did the diſorder return for ſome time after.

SECT. XXXIV.

ON THE PLEASURES OF THE POOR MAN.

——————Turn we to ſurvey
Where rougheſt climes a noble race diſplay,
Where the bleak Swiſs their ſtormy manſions tread,
And force a churliſh ſoil for ſcanty bread.
No product here the barren hills afford,
But man and ſteel, the ſoldier and his ſword.
No vernal blooms their torpid rocks array,
But winter lingering chills the lap of May;
No zephyr fondly ſues, the mountain's breaſt,
But meteors glare and ſtormy glooms inveſt.

Yet ſtill, e'en here, *content* can ſpread a charm,
Redreſs the clime and all its rage diſarm.—
Cheerful at morn, he wakes from ſhort repoſe,
Breathes the keen air, and carols as he goes;
With patient angle trolls the finny deep,
Or drives his vent'rous plough-ſhare to the ſteep;
Or ſeeks the den where ſnow-tracks mark the way,
And drags the ſtruggling ſavage into day.
At night returning, every labour ſped,
He ſits him down the monarch of a ſhed;
Smiles by his cheerful fire, and round ſurveys

His childrens' looks, that brighten at the blaze;
While his lov'd partner, boaſtful of her hoard,
Diſplays her cleanly platter on the board,
And haply too ſome pilgrim, thither led,
With many a tale repays the nightly bed.

GOLDSMITH.

SECT. XXXV.

ON THE ADVANTAGE OF A CULTIVATED MIND.

Such are the charms to barren ſtates aſſign'd,
Their *wants* but *few*, their *wiſhes all confin'd.*
Yet let them only ſhare the praiſes due;
If *few* their *wants*, their *pleaſures* are but *few*;
For *every want* that *ſtimulates* the breaſt
Becomes a *ſource* of *pleaſure* when redreſt.
Whence from ſuch lands each pleaſing ſcience flies,
That firſt *excites deſire, and* then *ſupplies*;
Unknown to them, when ſenſual pleaſures cloy,
To fill the languid pauſe with finer joy;
Unknown thoſe powers that raiſe the ſoul to flame,
Catch every nerve and vibrate through the frame.
Their level life is but a mould'ring fire,
Unquench'd by want, unfann'd by ſtrong deſire;
Unfit for raptures; or, if raptures cheer
On ſome high feſtival of once a year,
In wild exceſs the vulgar breaſt takes fire,
Till, buried in debauch, the bliſs expire.

THERE is not, ſays Dr. John Brown, *a finer ſtimulus*, than the pleaſurable feeling proceeding from a happy train or flow of thinking; hence the delight that ariſes from a flight of *wit*, or from a pleaſant vein of *humour*; hence all the fine feelings of the *belles lettres*; hence in youth, the *enthuſiaſm*, ſo natural to the human feelings, to out-ſtrip all others in every mental excellency. The arts, the ſciences, every department of human knowledge, are all the effects of that intellectual propenſity. How happy would it be for mankind were this noble ſtimulus duly cheriſhed! What benefits, which ſociety is deprived of, would not accrue from a proper cultivation of it! What muſt have been the delight of Pythagoras, when he found out the forty-ſeventh propoſition! He jumped about in an ecſtaſy, crying out Ευρηκα; and was ſo much more ſubſtantial than his other few brother diſcoverers, as to poſſeſs the means of offering a ſacrifice of an hundred fat bullocks to the gods! How delightful muſt the feelings of Milton have been, in whoſe works every page is an effort of the moſt beautiful, and of the moſt ſublime, conceptions of human genius! What were the lively ſenſations of Pope, Cowley, and Darwin, whoſe ſportive imaginations called at will myriads of beautiful ſcenes! How delightful the emotions of thoſe orators, whoſe eloquence has ſaved their reſpective countries; of thoſe preachers, who have rooted out the malignant paſſions, and implanted in their room the moſt perfect philanthropy; and laſty, of that phyſician from whoſe philoſophy a NEW MEDICINE hath ariſen with healing on her wings!

SECT.

SECT. XXXVI.

THE PLEASURES OF SIR ISAAC NEWTON.

SHALL the great ſoul of NEWTON quit this earth,
To mingle with *his ſtars*; and every muſe,
Aſtoniſh'd into ſilence, ſhun the weight
Of honours due to his illuſtrious name?
But what can *Man?* Ev'n now *The Sons of Light*,
In ſtrains high warbled to ſeraphic lyre
Hail *his arrival* on the coaſt of bliſs.
Yet am not I deterr'd, though high the theme,
And ſung to harps of angels, for with you
Ethereal Flames! ambitious, I aſpire
In NATURE's *general ſymphony* to join.

Have ye not liſten'd while HE bound the *ſuns*,
And *planets*, to their ſpheres! th' unequal taſk
Of human kind *till then*. Oft had they roll'd
O'er erring man the year, and oft diſgrac'd
The pride of ſchools, before their courſe was known
Full in its cauſes, and effects, to *him*
All-piercing ſage! who ſat not down and dream'd
Romantic ſchemes, ———————
But, bidding his *amazing mind* attend,
And with *heroic patience, years on years*,
Deep-ſearching, ſaw *at laſt* THE SYSTEM *dawn*,
And *ſhine*, of all his race, on HIM *alone*.

O, ineffable magnificence divine!
O, wiſdom truly perfect! thus to call
From a *few cauſes* ſuch a ſcheme of things,
Effects of various, beautiful, and great,
An *univerſe complete!* And O belov'd
Of heav'n! whoſe well-purg'd, penetrating, eye,
The myſtic veil tranſpiercing, in'y ſcann'd
The riſing, moving, wide-eſtabliſh'd frame,
Who, while on this dim ſpot, where mortals toil
Clouded in duſt, from motion's *ſimple laws*
Could trace *the ſecret hand* of PROVIDENCE
Wide-working through this univerſal frame.

WHAT WERE HIS RAPTURES THEN! HOW PURE! HOW STRONG!
And what *the triumphs* of old Greece and Rome
By *his* diminiſh'd, but the pride of boys
In ſome ſmall fray victorious! when inſtead
Of ſhatter'd parcels of this earth uſurp'd
By violence and blood, NATURE herſelf
Stood, *all ſubdu'd* by *him*, and open laid
Her every latent glory to *his* view.

HE firſt of men, with awful wing purſu'd
The *comet* through the long elliptic curve,
As round innumerous worlds he wings his way;
Till, to the forehead of our evening-ſky
Return'd the blazing wonder glares anew,
And o'er the trembling nations ſhakes diſmay.

All intellectual eye, our ſolar round
Firſt gazing through, HE, by the blended power
Of GRAVITATION and PROJECTION, ſaw
The whole in *ſilent harmony* revolve.

From unaſiſted viſion hid, the *moons*
To cheer remoter planets numerous form'd
By HIM in all their mingled tracts were ſeen.

HE alſo fix'd our *wandering queen* of *night*,
Whether ſhe wanes into a ſcanty orb,
Or, waxing broad, with her pale ſhadowy light,
In a ſoft deluge overflows the ſky.

Her every motion clear-diſcerning, HE,
Adjuſted to the billowy main, and taught
Why now the mighty maſs of water ſwells
Reſiſtleſs, heaving on the broken rocks,
And the full river turning; till again
The tide revertive, unattracted, leaves
A yellow waſte of idle ſands behind.

Then breaking hence, HE took his ardent flight
Through the blue infinite; and *every ſtar*
Which the clear concave of a winter's night
Pours on the eye, or aſtronomic tube,
Far-ſtretching, ſnatches from the dark abyſs,
Or ſuch as farther in ſucceſſive ſkies
To fancy ſhine alone, at *his approach*
Blazed into SUNS, the *living center* each

Of *an harmonious ſyſtem*: all *combin'd*
And rul'd unerring by that *ſingle power*
Which draws the ſtone projected to the ground.

The heavens are all his own; from the wild rule
Of whirling vortices, and circling ſpheres,
To their *firſt great ſimplicity* reſtor'd.

Th' aerial flow of *ſound* was known to him,
From whence it firſt in wavy circles breaks,
Till the touch'd organ takes the meſſage in.

Nor could the darting beam, *ſpeed* immenſe,
Eſcape his ſwift purſuit, and meaſuring eye.

Even *light* itſelf, which every thing diſplays,
Shone undiſcover'd till his brighter mind
Untwiſted all the *ſhining robe* of *day*;
And, from the whitening undiſtinguiſh'd blaze,
Collecting every ray into his kind,
To the charm'd eye educ'd the gorgeous train
Of parent colours. Firſt the flaming *red*
Sprung vivid forth; the tawny *orange* next;
And next delicious *yellow*; by whoſe ſide
Fell the kind beams of all refreſhing *green*,
Then the pure *blue*, that ſwells autumnal ſkies,
Ethereal play'd: and then, of ſadder hue,
Emerg'd the deepened *indico*, as when
The heavy ſkirted evening droops with froſt,

While the laſt gleamings of refracted light
Dy'd in the fainting *violet* away.

The noiſeleſs tide of time, all bearing down
To vaſt eternity's unbounded ſea,
He ſtemm'd alone: and to the ſource (involv'd
Deep in primeval gloom) aſcending, rais'd
His vivid lights to pilot home the *deep*
Hiſtorian, wilder'd in his darkſome way.

But who can *number* up his *labours?* who
His high *diſcoveries* ſing? When but few
Of the deep-ſtudying race can ſtretch their minds
To what he knew: in fancy's lighter thought,
How ſhall the muſe *then* graſp the *mighty theme?*

THOMSON.

SECT. XXXVII.

OF AMBITION.

Sweet is the concord of harmonious ſounds,
When the ſoft lute, or pealing organ ſtrikes
The well-attemper'd ear; ſweet is the breath
Of honeſt love, when nymph and gentle ſwain
Waft ſighs alternate to each other's heart:
But not the concord of harmonious ſounds,
When the ſoft lute, or pealing organ ſtrikes
The well attemper'd ear; nor the ſweet breath
Of honeſt love, when nymph and gentle ſwain
Waft ſighs alternate to each others heart,
So charm with raviſhment the raptur'd ſenſe,
As does the voice of well-deſerv'd report
Strike with ſweet melody the conſcious ſoul!

Although *imitation* is one of the greateſt inſtruments uſed by Providence in bringing our nature towards its perfection, yet if men gave themſelves up to *imitation* entirely, and each followed the other, and ſo on in an eternal circle, it is eaſy to ſee that there never could be any *improvement* amongſt them. Men muſt remain as brutes do, the ſame at the end as they are at this day, and that they were in the beginning of the world. To prevent this, God has planted in man a ſenſe of *ambition*, and a ſatisfaction ariſing from the contemplation of his excelling his fellows in ſomething deemed valuable amongſt them. It is this paſſion that creates advantages we all derive in civilized life, and it is this paſſion alſo, ill directed, which often unfortunately hinders men from granting to *Genius* its due.

SECT. XXXVIII.

ON LIBERTY.

My ſoul is ſick with ev'ry day's report
Of wrong and outrage with which earth is fill'd.
There is no yielding fleſh in man's hard heart,
It does not feel for man. The nat'ral bond
Of brotherhood is ſever'd as the flax
That falls aſunder at the touch of fire.
He finds his fellow *guilty* of a *ſkin*
Not *colour'd* like *his own*; and having pow'r
T' inforce the wrong, for ſuch *a worthy cauſe*
Dooms and devotes him as his lawful prey.
Thus man devotes his brother;
And worſe than all, and moſt to be deplor'd,
As human nature's broadeſt, fouleſt blot,
Chains him, and taſks him, and exacts his ſweat
With ſtripes, that mercy with a bleeding heart
Weeps when ſhe ſees inflicted on a *beaſt*.
Then what is man? And what man ſeeing this,
And having human feelings, does not bluſh
And hang his head, to think himſelf a man?
I would not have a ſlave to till my ground,
To carry me, to fan me while I ſleep,
And *tremble* when I wake, for all the wealth
That ſinews bought and ſold have ever earn'd.

No: dear as freedom is, and in my heart's
Juſt eſtimation priz'd above all price,
I had much rather be myſelf the ſlave,
And wear the bonds, than faſten them on him.
We have no ſlaves at home, then why abroad?
And they themſelves, once ferried o'er the wave
That parts us, are emancipate and loos'd.
Slaves cannot breathe in England; if their lungs
Receive our air, that moment they are free;—
They touch our country, and their ſhackles fall.
That's noble, and beſpeaks a nation proud
And jealous of the bleſſing. Spread it then,
And let it circulate through every vein
Of all your empire, that where Britain's power
Is felt, mankind may feel her mercy too.

Cowper.

O *Liberty*, thou goddeſs heav'nly bright,
Profuſe of bliſs, and pregnant with delight!
Eternal pleaſure in thy preſence reign,
And ſmiling plenty leads thy wanton train;
Eas'd of her load, ſubjection grows more light,
And poverty looks cheerful in thy ſight;
Thou mak'ſt the gloomy face of nature gay,
Giv'ſt beauty to the ſun, and pleaſure to the day.
Thee, goddeſs, *thee* Britannia's iſle adores;
How has ſhe oft exhauſted all her ſtores,
How oft, in fields of death, thy preſence ſought,
Nor thinks the mighty prize too dearly bought!

On foreign mountains, let the ſun refine
The grape's ſoft juice, and mellow it to wine;
With citron groves adorn a diſtant ſoil;
And the fat olive ſwell with floods of oil:
We envy not the warmer clime, that lies
In ten degrees of more indulgent ſkies,
Nor at the coarſeneſs of our heav'n repine,
Though o'er our heads the frozen pleiads ſhine;
'Tis *Liberty* that crowns Britannia's iſle,
That makes her barren rocks and bleakeſt mountains ſmile.

ADDISON.

SECT. XXXIX.

THE SAME SUBJECT CONTINUED.

Thee therefore, ſtill blame-worthy as thou art,
With all thy loſs of empire, and though ſqueez'd
By public exigence till annual food
Fails for the craving hunger of the ſtate,
Thee I account ſtill *happy*, and the chief
Among the nations, ſeeing thou art FREE!
My native nook of earth! thy clime is rude,
Replete with vapours, and diſpoſes much
All hearts to ſadneſs, and none more than mine;
Thine unadult'rate manners are leſs ſoft
And plauſible than ſocial life requires,
And thou haſt need of dicipline and art
To give *thee* that which warmer climes receive
From NATURE's bounty, *that humane addreſs*
And *ſweetneſs*, without which *no pleaſure* is
In *converſe*, either *ſtarv'd* by *cold reſerve*,
Or *fluſh'd* with *fierce diſpute*, a *ſenſeleſs brawl*;
Yet being FREE, I love *thee*. For the ſake
Of that ONE FEATURE, can be well content,
Diſgrac'd as *thou* haſt been, poor as *thou* art,
To ſeek no ſublunary reſt beſide.
But once ENSLAVED, farewell! I could endure
Chains no where patiently, and chains at home,
Where I am FREE by birthright, not at all.
————I ſhould then with double pain
Feel all the rigour of the fickle clime,
And if I muſt bewail the bleſſing loſt,
For which our Hampdens and our Sidneys bled,

I would at leaſt bewail it under ſkies
Milder, among a people leſs auſtere,
In ſcenes which, having never known me FREE,
Would not reproach me with the loſs I felt.
COWPER.

THERE are two great tyrannies, the tyranny of a deſpot, and that of a multitude. Of theſe the moſt dreadful is *republican tyranny*. The deſpot may receive the juſt blow, and fall from his high elevation, nothing is required but the arm of a Brutus: but the deſtruction of the many headed monſter is an herculean labour. In deſpotic ſtates, as well as in republics, the downfall of the miniſters of government is uſually effected by the death of the parties. In the former, they quietly yield up their breath; in the latter, the ſtruggle is attended with a dreadful convulſion, and the ſuperior faction gains the aſcendancy after a mighty carnage.

Situated *between* the *two* ſtands, the MIXED FORM of GOVERNMENT, a GOVERNMENT *nicely poiſed between* THE EXTREMES OF TOO MUCH LIBERTY and TOO MUCH POWER, where an unſucceſsful and improvident miniſter is diſplaced without the loſs of life, and the murder of his friends, and where the ſeveral parts of the CONSTITUTION are ſo framed, that they ſerve as a check to each other; a CONSTITUTION, where the king is clothed with a power, that enables him to do all the good he has a mind to; and wants no degree of authority, but what a good prince would not, and an ill one ought not to have: where he governs, though not abſolutely, yet glorioufly, becauſe he governs men, and not ſlaves; and is obeyed by them cheerfully, becauſe they know that, in obeying him, they obey thoſe laws only which they themſelves have had a ſhare in contriving.

It is undoubtedly very natural for men to think *that form* of *government* the beſt, under which they draw their firſt breath, and to propoſe it as a model and ſtandard for all others. But, if any people upon earth have a juſt title thus to boaſt, it is *we* of *this iſland*; who enjoy a CONSTITUTION, wiſely moulded, out of all the different forms and kinds of civil government, into ſuch an excellent and happy frame, as contains in it all the *advantages* of their ſeveral forms, without ſharing in any of their *great inconveniences*. Our MIXED FORM of GOVERNMENT is authoriſed by lawyers, admired by ſtrangers, recommended by divines, acknowledged by politicians, acquieſced in, nay paſſionately cheriſhed, by *the people* in general; and all this during a period of at leaſt a *hundred* and *eighty years*. This general conſent ſurely, during ſo long a time, muſt be ſufficient to render any conſtitution legal and valid: if the origin of all power be derived, as is alledged, from the people; here is *their conſent* in the fulleſt and moſt ample terms that can be derived or imagined. We muſt be all ſenſible that the plan of liberty is ſettled; its happy effects are proved by experience; a long tract of time has given it ſtability. We muſt be ſenſible, that public liberty with internal peace and order, has flouriſhed almoſt without interruption: trade and manufactures, and agriculture, have increaſed: the arts and ſciences, and philoſophy, have been cultivated. Even religious parties have been neceſſitated to lay aſide their mutual rancour: and the glory of the nation has ſpread itſelf all over Europe; derived equally from our progreſs in the arts of peace, and from our valour in war. *So long and ſo glorious a period no nation almoſt can boaſt of: nor is there another inſtance in the whole hiſtory of mankind, that ſo many millions of people have, during ſuch a ſpace of time, been held together, in a manner ſo free, ſo rational, and ſo ſuitable to the dignity of human nature.*

SECT. XL.

OF PATRIOTISM.

Dulce et decorum eſt pro patria mori.

Dear is the tie that links the anxious ſire
To the fond babe that prattles round his fire;
Dear is the love that prompts the generous youth,
His ſire's fond cares and drooping age to ſooth;
Dear is the brother, ſiſter, huſband, wife,
Dear all the charities of ſocial life:—
But not th' endearing ſprings that fondly move
To filial duty or parental love;
Nor all the ties that kindred boſoms bind,
Nor all the friendſhip's holy wreaths entwin'd,
Are half ſo dear, ſo potent to controul
The generous workings of the patriot ſoul,
As is that *holy voice* that cancels all
Thoſe ties, that bids him for his country fall.
At this high ſummons with undaunted zeal
He bares his breaſt; invites the impending ſteel:
Smiles at the hand that deals the fatal blow,
Nor heaves one ſigh for all he leaves below.

When Edward the Third, diſappointed of the throne of France by the brave reſiſtance of the garriſon of Calais, reſolved to take revenge, and demanded ſix of the principal inhabitants of that place to be led to him with halters about their necks, as a due atonement for the crime of reſiſtance to their lawful ſovereign, as he choſe to ſtyle himſelf, the governor, Euſtace Saint Pierre, firſt of all voluntarily and cheerfully gave himſelf up as a ranſom for the city, and "*I doubt not,*" ſays he, "*there are* "*many here as ready, nay, more zealous for this martyrdom than I can be, however modeſty and the fear* "*of imputed oſtentation may withhold them from being* "*foremoſt in exhibiting their merits.*"—"*Yes, there* "*are,*" exclaimed his ſon.—"*Ah, my child!*" cried St. Pierre, "*I am then twice ſacrificed.—But no—* "*I have rather begotten thee a ſecond time.—Thy years* "*are few, but full, my ſon; the victim of virtue has* "*reached the utmoſt purpoſe and goal of mortality.*"— "*Who next, my friends?—This is the hour of heroes.*" —"*Your kinſman!*" (cried James Wiſſant).— "*Your kinſman!*" (cried Peter Wiſſant).—"*Ah!*" (exclaimed Sir Walter Mauny, burſting into tears), "*Why was I not a citizen of Calais!*"

The ſixth victim was ſtill wanting, but was ſupplied by lot, from numbers who were emulous of ſo ennobling an example.

The keys of the city were then delivered to Sir Walter. He took the ſix priſoners into his cuſtody. But before they departed, the citizens deſired permiſſion to take their laſt adieu of their deliverers.— What a parting! what a ſcene! They crowded with their wives and children about St. Pierre and his fellow priſoners. They embraced, they fell proſtrate before them. They groaned; they wept aloud; and the clamour of their mourning paſſed the gates of the city, and was heard throughout the camp.

At length Saint Pierre and his fellow victims appeared under the conduct of Sir Walter and his guard. All the tents of the Engliſh were inſtantly emptied. The ſoldiers poured from all parts, and arranged themſelves on each ſide, to admire this little band of *patriots* as they paſſed. They murmured their applauſe of that virtue which they could not but revere even in enemies; and they regarded thoſe ropes which they had aſſumed about their necks, as enſigns of greater dignity than that of the Britiſh Garter.

As ſoon as they had reached the royal preſence, "Mauny," (ſays the king) "*are theſe the principal* "*inhabitants of* Calais?" "*They are,*" (ſays Mauny): "*they are not only the principal men of Calais;* "*they are the principal men of* France, *my lord, if* "*virtue has any ſhare in the act of ennobling.*" "*Were* "*they delivered peaceably?*" (ſays Edward); "*was* "*there no reſiſtance, no commotion among the people?*" "*Not in the leaſt, my lord. They are ſelf-deli-*"*vered, ſelf-devoted, and come to offer up their ineſti-*"*mable heads, as an ample equivalent for the ranſom* "*of thouſands.*"

The king, who was incenſed at the difficulties of the ſiege, ordered them to be carried to *immediate execution*; nor could all the remonſtrances of his courtiers divert him from his purpoſe.—But what neither a regard to his own intereſt and honour, the dictates of juſtice, nor the feelings of humanity, could effect, was accompliſhed by the influence of conjugal affection. The queen, who was then advanced in pregnancy, being informed of the particulars reſpecting the ſix victims, flew into her huſband's preſence, threw herſelf on her knees before him, and with tears in her eyes beſought him not to ſtain his character with an indelible mark of infamy, by committing ſuch a barbarous deed. Edward could refuſe nothing to a wife whom he ſo tenderly loved, and eſpecially in her ſituation; and the queen, not ſatisfied with having ſaved the lives of the ſix burghers, conducted them to her tent, where ſhe applauded *their virtue*, regaled them plentifully, and having made them a preſent of money and clothes, ſent them back to their fellow-citizens.

SECT. XLI.

OF SYMPATHY.

PLEASURE and PAIN, ſays Fontenelle, which are two ſentiments ſo different in themſelves, differ not much in their cauſe. From the inſtances of tickling, it appears, that the movement of *pleaſure*, puſhed a little too far, becomes *pain*; and that the movement of *pain* a little moderated becomes *pleaſure*.

It is by *ſympathy* that we enter into the concerns of others; that we are moved as they are moved, and are never ſuffered to be indifferent ſpectators of almoſt any thing which men can do or ſuffer. For *ſympathy* muſt be conſidered as a ſort of ſubſtitution, by which we are put into the place of another man, and affected in many reſpects as he is affected. It is by this principle chiefly that poetry, painting, and the other arts of peace, tranſfuſe their paſſions from one breaſt to another, and are often capable of exciting a delight from wretchedneſs, miſery, and even death itſelf. This taken as a fact, has been the cauſe of much reaſoning. The ſatisfaction has been commonly attributed, firſt, to the comfort we receive in conſidering that ſo melancholy a ſtory is no more than a *fiction*; and next, to the contemplation of *our own freedom* from the *evils* which we ſee repreſented. But I believe the nearer any tragedy approaches to reality, and the further it removes us from any idea of fiction, the more exquiſite is the gratification. Do we not read the authentic hiſtories of ſcenes of this nature with as much pleaſure as romances or poems, where the incidents are fictitious? The proſperity of no empire, ~~nor~~ the grandeur of no king, can ſo agreeably affect in the reading, as the ruin of the ſtate of Macedon, and the diſtreſs of its unhappy prince. Such a cataſtrophe touches us in hiſtory as much as the deſtruction of Troy does in fable. Our delight, in caſes of this kind, is very greatly heightened, if the ſufferer be ſome excellent perſon, who ſinks under an unworthy fortune. Scipio and Cato are both ~~virtuous~~ characters; but we are more deeply affected by the violent death of the one, and the ruin of the great cauſe he adhered to, than with the deſerved triumphs and uninterrupted proſperity of the other; for *every emotion of the mind produces delight*, except when the ſenſation preſſes upon us too cloſe. Thus Lord Clarendon, when he approaches towards the cataſtrophe of the royal party, ſuppoſes that his narration muſt then become infinitely diſagreeable; and he hurries over the beheading of King Charles, without giving us one circumſtance of his death. He conſiders it as too horrid a ſcene to be contemplated with any ſatisfaction, or even without the utmoſt pain and averſion.

He himſelf, as well as the readers of that age, were too deeply concerned in the events, and felt a pain, which an hiſtorian and a reader of another age would regard as the moſt pathetic and intereſting, and by conſequence the moſt agreeable.

NATURE has formed us for *activity*, and the emotions of the ſoul are ſources of delight, be the exciting cauſes what they will: for I am convinced, we have a degree of delight, and that no ſmall one, in the real misfortunes and pains of others; for let the affection be what it will in appearance, if it does not make us fly from them, in this caſe I conceive we muſt have a delight or pleaſure of ſome ſpecies or other. If this paſſion was ſimply painful, we ſhould ſhun, with the greateſt care, all perſons and places that could excite ſuch a ſenſation. But the caſe is widely different with the greater part of mankind; there is no ſpectacle we ſo eagerly purſue, as that of ſome uncommon and grievous calamity; ſo that whether this misfortune is before our eyes, or whether it be repreſented on the ſtage, it always touches with delight. The more real, the keener is the ſenſation. Chooſe the day, on which to repreſent the moſt ſublime and affecting tragedy we have; appoint the moſt favourite actors; ſpare no coſt upon the ſcenes and decorations; unite the greateſt efforts of poetry, painting, and muſic; and when you have collected your audience, juſt at the moment when their minds are erect with expectation, let it be announced, that a *ſtate criminal* of *high rank* is on the point of being executed; in a moment the emptineſs of the theatre would demonſtrate the comparative weakneſs of the imitative arts, and proclaim the triumph of real ſympathy: for our CREATOR has deſigned we ſhould be united by the bond of ſympathy, and hath ſtrengthened that bond by a proportional delight; and there moſt, where our ſympathy is moſt wanted: and HE hath alſo wiſely ordained that this delight ſhould, by preſſing on us too ſtrongly, finally give way to *real uneaſineſs.* The delight we have in ſuch events hinders us from ſhunning ſcenes of miſery; and the pain we afterwards feel, prompts us to relieve ourſelves in relieving thoſe who ſuffer; and all this antecedent to any reaſoning by an inſtinct that works us to its own purpoſes without our concurrence.

SECT. XLVI.

A SINGULAR INSTANCE OF SYMPATHY.

O *Greece!* thou ſapient nurſe of finer arts;
——————————whoſe every ſon,
Even the laſt mechanic, the true taſte poſſeſs'd,
Thine was the meaning muſic of the heart;
Not the vain trill, that, void of paſſion, runs
In giddy mazes, tickling idle ears;—
But that deep-ſearching voice, and artful hand,
To which, reſpondent, ſhakes the varied ſoul.
THOMSON.

WHEN the appointed day arrived, the whole inhabitants of Athens, whether citizens or ſtrangers, aſſembled early in the Piræus, to admire the greateſt ſpectacle ever beheld in a Grecian harbour.

A hundred gallies were adorned with all the ſplendour of naval pomp: the troops deſtined to embark, vied with each other in the elegance of their dreſs, and the brightneſs of their arms: the alacrity painted in every face, and the magnificence diſplayed with profuſion in every part of the equipage, repreſented a triumphal ſhow, rather than the ſtern image of war. But the ſolidity and greatneſs of the armament proved that it was intended for uſe, and not oſtentation.

Amidſt this glare of external pageantry which accompanied the adventurous youth, their friends and kinſmen could not ſuppreſs a few parting tears, when they conſidered the dangers of the ſea, and the uncertainty of beholding again the deareſt pledges of their affection. But their partial expreſſions of grief were ſpeedily interrupted by the animating ſounds of the trumpet, which iſſued at once from an hundred ſhips, and provoked ſympathetic acclamations from the ſhore.

The captains then offered ſolemn prayers to the gods, which were anſwered by correſponding vows from the ſpectators: the cuſtomary libations were poured out; and, after the triumphant Pæan had been ſung in full chorus, the whole fleet at once ſet ſail, and contended for the prize of naval ſkill and celerity, until they reached the lofty ſhores of Ægina, from whence they enjoyed a proſperous navigation to the rendezvous of their confederates at Corcyra.

There the commanders reviewed the ſtrength of the armament, which conſiſted of an hundred and thirty-four ſhips of war, with a proportioned number of tranſports and tenders.

At a moderate computation, we may eſtimate the whole military and naval ſtrength at twenty thouſand men.

When the inhabitants of Syracuſe heard the firſt rumours of the Athenian invaſion, they deſpiſed them, as idle lies invented to amuſe the populace. The hoſtile armament had arrived at Rhegium before they could be perſuaded, by the wiſdom of Hermocrates, to provide againſt a danger which their preſumption painted as imaginary. But when they received undoubted intelligence that the enemy had reached the Italian coaſt; when they beheld their numerous fleet commanding the ſea of Sicily, and ready to make a deſcent on their defenceleſs iſland, they were ſeized with a juſt degree of terror and alarm proportional to their falſe ſecurity. From the heights of preſumption they plunged into the depths of deſpair, and their ſpirits were, with difficulty, reſtored by the animating voice of the brave and prudent Hermocrates.

Only a few days elapſed before the adverſe armies prepared to engage. The Syracuſan generals drew up their troops ſixteen, and the Athenians only eight, deep; but the latter had, in their camp, a body of reſerve, which was kept ready for action on the firſt ſignal.

The attack was begun with fury, and continued with perſeverance for ſeveral hours. Both ſides were animated with the utmoſt vigour of exertion, when a tempeſt ſuddenly aroſe, accompanied with unuſual peals of thunder. This event, which inſpired the Athenians with freſh courage, confounded the unexperienced credulity of the Syracuſans, who were broken and put to flight.

Encouraged by ſucceſs, the Athenians puſhed the enemy with vigour. The populace of Syracuſe clamoured, with their uſual licentiouſneſs, againſt the incapacity or perfidy of their leaders, to whom alone they aſcribed their misfortunes. New generals were named in the room of Hermocrates and his colleagues; and this injudicious alteration increaſed the calamities of the city, which at length prepared to capitulate.

While the aſſembly deliberated concerning the execution of a meaſure, which, however diſgraceful, was declared to be neceſſary, a galley penetrated into the harbour, which announced a ſpeedy and effectual relief to the beſieged city.

The deſponding citizens heard, with pleaſing aſtoniſhment, that Gylippus, a Spartan general, had landed on the weſtern coaſt of the iſland. This determined the wavering irreſolution of the Syracuſans. The moſt courageous ſallied forth to meet this generous and powerful protector. A junction was happily effected; the ardour of the troops kindled into enthuſiaſm; and they diſtinguiſhed that memorable day by a ſignal victory over the Athenians.

The Syracuſans had ſcarcely time to rejoice at their victory, or Nicias to bewail his defeat, when a numerous and formidable armament appeared on the coaſt. The foremoſt gallies, their prows adorned with gaudy ſtreamers, purſued a ſecure courſe towards the harbour of Syracuſe. The emulation of the rowers was animated by the mingled ſounds of the trumpet and clarion; and the regular decoration, the elegant ſplendor, which diſtinguiſhed every part of the equipment, exhibited a pompous ſpectacle of naval triumph. Their appearance, even at a diſtance, announced the country to which they belonged; and both the joy of the beſiegers, and the terror of the beſieged, acknowledged that Athens was the only city in the world capable of ſending to ſea ſuch a beautiful and magnificent contribution.

Nicias expected, by the valour of theſe freſh troops, which amounted to above twenty thouſand, to obtain in one day the valuable reward of long and ſevere labour. He choſe the firſt hour of a moon-light night to attack the enemy. The outpoſts were ſurpriſed; the guards put to the ſword; and three ſeparate encampments of the *Syracuſans*, *Sicilians*, and *allies*, formed a feeble oppoſition to the *Athenian* ardour. As if their victory had already been complete, they urged on the purſuit with a rapidity that diſordered their ranks. Meanwhile, the vigilant activity of Gylippus had aſſembled the whole force of Syracuſe. The *Athenians* were decoyed within the intricate windings of the walls, and their irregular fury was firſt checked by the firmneſs of a *Spartan* phalanx.

A reſiſtance ſo ſudden and unexpected might alone have been deciſive; but other circumſtances were adverſe to the *Athenians*: their ignorance of the ground, the alternate obſcurity of the night, and the deceitful glare of the moon, which, ſhining in the front of this phalanx, illumined the ſplendour of their arms, and multiplied the terror of their numbers.

The foremoſt ranks of the purſuers were repelled; and as they retreated to the main body, they encountered part of their own army, who were advancing, and unfortunately they miſtook them for enemies.

Fear, and then rage, ſeized the *Athenians*, who believing themſelves encompaſſed on all ſides, determined to force their way, and committed much bloodſhed among their friends, before the miſtake could be diſcovered.

To prevent the repetition of this dreadful error, their ſcattered bands were obliged at every moment to demand the watch-word, which was at length betrayed to their adverſaries. The conſequence of this was doubly fatal. At every rencounter the ſilent *Athenians* were ſlaughtered without mercy, while the enemy, who knew their watch-word, might at pleaſure join, or decline, the battle, and eaſily oppreſs their weakneſs or elude their ſtrength.

The terror and confuſion increaſed; the rout became general; and Gylippus purſued in good order with his victorious troops. Many abandoned their arms, and explored the unknown paths of the neighbouring rocks. Others threw themſelves from precipices, rather than await the purſuers. Several thouſands were left dead or wounded on the ſcene of action, and in the morning the greater part of the ſtragglers were intercepted by the horſe.

This dreadful and unexpected diſaſter ſuſpended the operation of the ſiege. The *Athenian* general ſpent the time in uſeleſs deliberations concerning their future meaſures, while the army was obliged to be encamped on the marſhy and unhealthy banks of the Anapus.

The viciſſitudes of an autumnal atmoſphere, corrupted by the foul vapours of an unwholeſome ſoil, made a ſevere impreſſion on the *irritable fibres* of men exhauſted by *fatigue*, dejected by *diſgrace*, and deprived of *hope*. A general ſickneſs broke out in the camp. Some of the commanders urged this calamity as a new reaſon for haſtening their departure, while it was yet poſſible. But Nicias diſſuaded from the deſign of leaving Sicily until they ſhould be warranted to take this important ſtep by the poſitive authority of the republic.

Meanwhile the prudence of Gylippus profited of the fame of his victory, to draw a powerful reinforcement from the *Sicilian* cities: and the tranſports, long expected from the Peleponneſus, finally arrived in the harbour of Ortygia.

The acceſſion of ſuch powerful auxiliaries to the beſieged, and the force of the malady increaſing, the *Athenians* were totally diſconcerted. Even Nicias agreed to ſet ſail.—When the fleet was ready for ſea, he recalled the troops from the various ports and fortreſſes they occupied, and with a cheerful and magnanimous firmneſs, he removed the dejection of the *Athenians*, exhorting them, before they embarked, "to remember the viciſſitudes "of war, and the inſtability of fortune. Though "hitherto unſuccesful, they had every thing to ex-

" pect from the ſtrength of their actual preparations; " nor ought men, who had tried and ſurmounted ſo " many dangers, to yield to the weak prejudices of " inexperience and folly, and cloud the proſpect of " future victory, by the gloomy remembrance of " paſt defeat."

When Gylippus and the *Syracuſan* commanders were appriſed of the deſign of the enemy, they haſtened to prevent it. An engagement ſoon took place in the harbour; and in this narrow ſpace, more than two hundred gallies fought, during the greateſt part of the day, with an obſtinate and perſevering valour. The battle was not long confined to the ſhock of adverſe prows, and to diſtant hoſtility of darts and arrows. The neareſt veſſels grappled, and cloſed with each other, and their decks were ſoon deluged with blood. While the heavy armed troops boarded the enemy's ſhips, they left their own expoſed to a ſimilar misfortune; the fleets were divided into maſſive cluſters of adhering gallies; and the confuſion of their mingled ſhouts overpowered the voice of authority; the *Athenians* exhorting, " not to abandon an element on which their republic " had ever acquired victory and glory, for the dan- " gerous protection of an hoſtile ſhore;" and the *Syracuſans* encouraging each other " not to fly " from an enemy whoſe weakneſs or cowardice had " long meditated a flight."

The ſingular and tremendous ſpectacle of an engagement more fierce and obſtinate than any that had ever been beheld in the Grecian ſeas, reſtrained the activity, and totally ſuſpended the powers of the numerous and adverſe battalions which encircled the coaſt. The ſpectators and actors were equally intereſted in the important ſcene; but the former, the current of whoſe ſenſibility was undiverted by any exertion of body, felt more deeply, and expreſſed more forcibly, the various emotions by which they were agitated. Hope, fear, the ſhouts of victory, the ſhrieks of deſpair, the anxious ſolicitude of doubtful ſucceſs, animated the countenance, the voice, and the geſture of the *Athenians*, whoſe reliance centered in their fleet. When at length their gallies evidently gave way on every ſide, the contraſt of alternate, and the rapid tumult of ſucceſſive paſſions, ſubſided into a melancholy calm. This dreadful pauſe of aſtoniſhment and terror was followed by the diſordered trepidation of flight and fear: and many eſcaped to the camp, which protected their landing.

In this well-fought battle, the vanquiſhed had loſt fifty, and the victors forty veſſels. It was incumbent on the Athenians to recover the dead bodies of their friends, that they might be honoured with the ſacred and indiſpenſable rites of funeral. But they abandoned to inſult and indignity the bodies of the ſlain; and when Nicias propoſed to them to accompliſh this neceſſary duty, which before under no circumſtances they had ever neglected, yet did they decline to encounter again the armament of Syracuſe.

Their only deſire was to eſcape by land, under cover of the night, from a foe whom they had not courage to oppoſe, and from a place where every object was offenſive to their ſight, and moſt painful to their reflections.

The day was far ſpent; the ſtrength of the Syracuſan ſailors had been exhauſted by a long continuance of unremitted labour: and both they and their companions on ſhore were more deſirous to return to Syracuſe to enjoy the fruits of victory, than to irritate the dangerous deſpair of the vanquiſhed Athenians. The evening of the battle was the vigil of the feaſt of Hercules; and the ſtill agitated combatants awakened, after a ſhort and feveriſh repoſe, to celebrate the memory of their favourite hero, to whoſe propitious influence they probably aſcribed the merit of the moſt ſplendid trophy that ever adorned the fame of Syracuſe. The coincidence of a feſtival and a victory excited the utmoſt extravagance of licentious joy, and the exceſſes of ſenſual indulgence. Amidſt theſe giddy tranſports, the Syracuſans loſt all remembrance of an enemy whom they deſpiſed; even the ſoldiers on guard joined the diſſolute and frivolous amuſements of their companions; and, during the greateſt part of the night, Syracuſe preſented a mixed ſcene of ſecure gaiety, of thoughtleſs jollity, and of mad and dangerous diſorder.

The camp of the *Athenians* was raiſed the next morning. Thirty thouſand men, of whom many were afflicted with wounds and diſeaſe, and all exhauſted by fatigue, and dejected by calamity, preſented on this occaſion a moſt doleful ſight. They had miſerably fallen from the lofty expectations with which they ſailed in triumph to the harbour of Syracuſe.—They had abandoned their fleet, their tranſports, the hopes of victory, and the glory of the *Athenian* name; and theſe collective ſufferings were enhanced and exaſperated by the painful images which ſtruck the eyes and the fancy of each unfortunate individual.—The mangled bodies of their companions and friends, deprived of the ſacred rites of funeral, affected them with a ſentiment of religious horror, on which the weakneſs of human nature is happily unable to dwell —They removed their attention from this dreadful ſight; but they could not divert their compaſſion from a ſpectacle ſtill more melancholy, the numerous crowds of ſick and wounded, who followed them with enfeebled and unequal ſteps, intreating, in the accent and attitude of unutterable anguiſh, to be delivered from the rage of an exaſperated foe. Amidſt ſuch affecting ſcenes, the heart of a ſtranger would have melted with tender ſympathy; but how much more muſt it have afflicted the *Athenians*, to ſee their parents, brothers, and friends, involved in unexampled miſery! to hear, without the poſſibility of relieving, their lamentable complaints! and reluctantly to throw the clinging victims from their wearied necks and arms! Yet the care of perſonal ſafety prevailed over every other care; for the ſoldiers were not only encumbered by their armour, but oppreſſed by the weight of their proviſions.

The ſuperior rank of Nicias entitled him to a pre-eminence of toil and woe; and he deſerves the regard of poſterity by his character and ſufferings, and ſtill more by the melancholy firmneſs of his conduct. The load of accumulated diſtaſters did not ſink him into inactive deſpondency. Though afflicted with the ſtone, he moved with a rapid pace around every part of the army, and the ardour of his mind re-animating the languor of his debilitated frame, he exclaimed, with a loud and diſtinct voice, " *Athenians* and *allies*, there is yet room for " hope. Many have eſcaped from ſtill greater " evils; nor ought you raſhly to accuſe either fortune or yourſelves. As to me, who in bodily " ſtrength excel not the weakeſt among you, and " who in the happineſs of private life, and the deceitful gifts of proſperity, had long been diſtinguiſhed above the moſt illuſtrious of my contemporaries, I am now confounded in affliction with " the meaneſt and moſt worthleſs. Yet am I unconſcious of deſerving ſuch a fatal reverſe of fortune. For this reaſon I am ſtill animated with " confidence; calamities, unmerited by guilt, are " diſarmed of their terrors. Our numbers, our reſolutions, and even our misfortunes, ſtill render " us formidable. There is not any army ready to " intercept our courſe; much leſs any capable of

“ expelling us from the firſt friendly territory in “ which we ſhall fix our camp. If we can ſecure, “ therefore, our peſent ſafety, by a prudent, ſpee-“ dy, and courageous retreat, we may afterwards “ retrieve our loſt honour, and reſtore the fallen “ glory of Athens; ſince the chief ornament of a “ ſtate conſiſts in brave and virtuous men, not in “ empty ſhips and undefended walls.”

The actions of Nicias fully correſponded with his words. He neglected none of the duties of a great general. The troops were divided into two bodies. Nicias led the van; Demoſthenes conducted the rear; the baggage occupied the centre.

In this order of march they paſſed the river Anapus, and having proceeded beyond it five miles, they encamped in the evening on a riſing ground, after being much haraſſed during the latter part of the journey by the Syracuſan cavalry and archers, who galled them at a diſtance, intercepted the ſtragglers, and avoided, by a ſeaſonable retreat, to commit the ſecurity of their own fortune with the dangerous deſpair of the Athenians.

The next day the Athenians had a defile to paſs where the Syracuſans were poſted in great force. In vain the Athenians attempted, on three ſucceſſive days, to force the paſſage. They were repelled with loſs in every new attack, which became more feeble than the preceding. In the firſt and moſt deſperate, an accidental ſtorm of thunder increaſed the courage of the Syracuſans and the terror of the

Athenians. A ſimilar event had, in the firſt engagement after the invaſion of Sicily, produced an oppoſite effect on the contending nations. But the hopes and the fears of men change with their fortune.

They gave up at length the hopes of forcing this paſſage, and under the cover of the night they hoped to evade the enemy, and left their encampment in the ſame order they had before obſerved. But they had not proceeded far in this nocturnal expedition, when the obſcurity of the ſkies, the deceitful tracts of an unknown and hoſtile country, filled the moſt timid or unfortunate with imaginary terrors, and Demoſthenes, with above one half of his diviſion, in this confuſion, fatally miſtook the road, and quitted, never more to rejoin, the reſt of the army.

Nicias with the reſt of the forces reached the banks of the river Aſſinaros. There Gylippus and the Syracuſans aſſaulted them during the whole day with darts, arrows, and javelins. Their diſtreſs was moſt lamentable and incurable, yet hope did not totally forſake them; for, like men in the oppreſſion and languor of a conſuming diſeaſe, they ſtill entertained a confuſed idea, that their ſufferings would end, could they but reach the oppoſite banks of the river. The deſire alſo of aſſuaging their thirſt, encouraged this daring deſign. They ruſhed with frantic diſorder into the rapidity of the ſtream; the purſuing Syracuſans, who had occupied the rocky banks, deſtroying them with innumerable volleys of miſſile weapons. In the Aſſinaros they had a new enemy to contend with. The depth and force of the waters triumphed over their ſingle, and ſhook their implicated ſtrength. Many were borne down the ſtream. At length the weight of their numbers reſiſted the violence of the torrent; but a new form of danger preſented itſelf to the eyes of Nicias. His ſoldiers turned their fury againſt each other, diſputing, with the point of the ſword, the fordable parts of this turbid ſtream. This ſpectacle melted the firmneſs of his manly ſoul. He conſented to aſk quarter for the miſerable remnant of his troops, who had not periſhed in the Aſſinaros, or been deſtroyed by the Syracuſan archers and cavalry. His ſoldiers having laid down their arms were entitled to the pity and protection of Gylippus; who, after ſending proper detachments to intercept and collect the ſtragglers, returned in triumph to the city with the ineſtimable trophies of his valour and conduct.

The generals Nicias and Demoſthenes were ſucceſſively brought to Syracuſe. Gylippus would have ſpared their lives, not from any motives of humanity and eſteem, but that his joyous return to Sparta might have been graced by their preſence. But the reſentment of the Syracuſans, and, above all, the ſuſpicious jealouſy of thoſe perfidious traitors who had maintained a ſecret correſpondence with Nicias, which they dreaded leſt the accidents of his future life might diſcover, loudly demanded the immediate execution of the captive generals. The Athenians juſtly regretted the loſs of Demoſthenes, a gallant and enterpriſing commander; but poſterity will for ever lament the fate of Nicias, the moſt pious, the moſt virtuous, and the moſt unfortunate man of the age in which he lived.

The other priſoners were condemned to labour in the mines and quarries of Sicily: their whole ſuſtenance was bread and water: day and night they languiſhed in this dreadful captivity, during which, the diſeaſes incident to this manner of life were rendered infectious by the ſtench of the dead bodies, which corrupted the purity of the ſurrounding air. At length an eternal ſeparation was made between thoſe who ſhould enjoy the *happier lot* of returning to their country, friends, and relatives, and thoſe who were for ever to be confined to their dreadful dungeons. The Syracuſans, who could puniſh their helpleſs captives with ſuch unrelenting ſeverity, had often melted into tears at the rehearſal of the affecting ſtrains of Euripides, an Athenian poet, who had learned in the Socratic ſchool to adorn the leſſons of philoſophy with the charms of fancy, and who was regarded by the taſte of his contemporaries, as he ſtill is by many enlightened judges, as the moſt tender and pathetic, the moſt philoſophical and inſtructive, of all the ancient tragic writers*.

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* The Greek play was ſung, and every citizen had free admittance to theſe public entertainments. The ancient theatres contained from 20 to 30,000 people, who were admitted gratis.

The pleaſure which the Syracuſans had derived from his inimitable poetry, made them delight in hearing it ſung by the flexible voices and harmonious pronunciation of the Athenians, ſo unlike, and ſo ſuperior to the rudeneſs and aſperity of their own doric dialect.

They deſired thoſe captives, who could ſing, to rehearſe thoſe plaintive ſcenes of their favourite bard. The captives obeyed; and affecting to repreſent the woes of kings and heroes, they too faithfully expreſſed their own.

Their taſte and ſenſibility endeared them to the Syracuſans, who ſoon releaſed their bonds; and, after treating them with all the honourable diſtinctions of ancient hoſpitality, reſtored them to their longing and afflicted country, as a ſmall but precious wreck of the moſt formidable armament that had ever ſailed from a Grecian harbour.

At their return to Athens, the grateful captives walked in ſolemn proceſſion to the houſe of Euripides, whom they hailed as their deliverer from ſlavery and death*.

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* Vide *The Hiſtory of Greece* by Dr. Gillies, a work which xhibits throughout the deepeſt reſearch, the moſt elegant arrative, and the ſoundeſt reflections.

THE PRINCIPLES OF MORAL PHILOSOPHY.

IN MEDIO STAT VIRTUS.

SECT. XLIII.

ON SELF-LOVE, AND SOCIAL AFFECTION.

On their own axis as the planets run,
Yet make at once their circle round the ſun:
So *two conſiſtent motions* actuate the ſoul;
And one regards *itſelf*, and one the *whole*.

POPE.

THE original conſtitution of our nature with reſpect to the mixture of *ſelfiſh* and *ſocial affection*, diſcovers in this, as in every other part of our frame, profound and admirable wiſdom. Each individual is by his CREATOR committed particularly to himſelf and his own care. He knows and conſiders his own ſituation beſt, and has more opportunities of promoting his own happineſs, than he can have of advancing the happineſs of any other perſon. It was therefore fit, it was neceſſary, that in each individual *ſelf-love* ſhould be the ſtrongeſt and moſt active inſtinct.

This *ſelf-love*, if he had been a being who ſtood ſolitary and alone, might have proved ſufficient for the purpoſe both of his preſervation and his welfare. But *ſuch* was not intended to be the ſituation of man. He is mixed among multitudes of the ſame nature. In theſe multitudes, the *ſelf-love* of one man, or attention to his own particular intereſt, encountering the *ſelf-love* and the intereſt of another, could not but produce frequent oppoſition, and innumerable miſchiefs. It was neceſſary, therefore, to provide a *counterbalance* to this part of his nature; which is accordingly done, by implanting in him thoſe *ſocial* and *benevolent inſtincts*, which lead him in ſome meaſure out of himſelf, to follow the intereſt of others.

The ſtrength of theſe *ſocial inſtincts*, is, in general, proportioned to their importance in human life. Thus, that *parental affection*, which the helpleſs ſtate of infancy and childhood renders ſo needful, is made the ſtrongeſt of them all. Next, come thoſe ties of *blood*, which prompt mutual kindneſs among thoſe who are intimately joined together by brotherhood, and other family connexions. To theſe ſucceeds that valuable inſtinct of *pity*, which impels us to aſſiſt the diſtreſſed wherever we behold them. Hence that degree of ſenſibility, which prompts us to weep with them that weep, is ſtronger than that which prompts us to rejoice with them that rejoice; for this plain reaſon, that the unhappy ſtand more in need of our fellow feeling and aſſiſtance than the proſperous.

Still, however, it was requiſite, that in each individual the quantity of *ſelf-love* ſhould remain in a large proportion, on account of its importance to the preſervation of his life and well-being. But as the quantity requiſite for this purpoſe is apt both to ingroſs his attention, and to carry him into criminal exceſſes, the perfection of his nature is meaſured by the *counterpoiſe* of thoſe *ſocial principles* which, tempering the force of the *ſelfiſh affection*, render man not only uſeful to himſelf, but to thoſe about him.

SECT. XLIV.

OF PRIDE, AND THE LOVE OF PRAISE.

Meanwhile *opinion* gilds with varying rays
Thoſe painted clouds that beautify our days;
Each want of happineſs by hope ſupplied,
And *each vacuity* of *ſenſe* by PRIDE:
Theſe build as faſt as knowledge can deſtroy;
In folly's cups ſtill laughs the bubble joy.
One proſpect loſt, another ſtill we gain,
And not a VANITY is given *in vain.*

POPE.

AMIDST thoſe inequalities of condition, which the ſtate of human life requires, where it was neceſſary that ſome ſhould be rich, and others poor, that ſome ſhould be eminent and diſtinguiſhed, and others obſcure and mean, how ſeaſonable is that *good pinion* which every one entertains of himſelf; that *elf-complacency* with which he prefers himſelf to thers;

Whate'er the paſſion, knowledge, fame, or pelf,
Not one will *change his neighbour with himſelf:*

POPE.

nd that fond hope, which is ever pleaſing him with he proſpect of future pleaſures and advantages in life. Without thoſe *flattering ſenſations*, vain as they often are, how totally inſupportable would this world become to many of its inhabitants. Whereas by means of them, PROVIDENCE hath wiſely balanced the inequalities of condition among mankind It hath contrived to diffuſe pleaſure through all ranks; and to bring the high and low nearer to a level with each other than might at firſt be ſuppoſed. It hath ſmoothed the moſt rugged tracts of human life; and hath gilded with rays of borrowed light its moſt dreary ſcenes.

We are alſo intended by PROVIDENCE to be connected with one another in *ſociety*. By means of *ſociety* our wants are ſupplied, and our lives rendered comfortable; our capacities are enlarged, and our virtuous affections called forth into proper exerciſe. In order to confirm our *mutual connexion*, it was neceſſary that ſome attracting power ſhould pervade the human breaſt. Nothing could more happily fulfil this purpoſe, than our being ſo formed as to deſire the good eſteem of others. Had ſuch a propenſity been wanting, *ſociety* muſt have proved an unharmonious and diſcordant ſtate. Inſtead of mutual attraction, a repulſive power would have prevailed. Among men who had no regard to the *approbation* of one another, all intercourſe would have been jarring and offenſive. For the wiſeſt ends, therefore, the deſire of *praiſe* was made an original and powerful principle in the human breaſt.

To a variety of good purpoſes it is ſubſervient, and on many occaſions co-operates with the principle of virtue. It has given riſe to moſt of the ſplendid, and to many of the uſeful, enterpriſes of men. It has animated the patriot, and fired the hero. It awakens us from ſloth, invigorates activity, and ſtimulates our efforts to excel. The deſire of *praiſe* is alſo connected with all the finer ſenſibilities of human nature.—But while the love of *praiſe* is admitted to be a natural, and, in ſo many reſpects, an uſeful principle of action, we are to obſerve, that it is entitled to no more than our ſecondary regard. *It has its boundaries ſet, by tranſgreſſing which, it is at once transformed from an innocent into a moſt dangerous paſſion.* More ſacred and venerable principles claim the chief direction of human conduct. All the good effects which we have aſcribed to the deſire of *praiſe*, are produced by it when remaining in a ſubordinate ſtation. But when paſſing its natural line, it becomes the ruling ſpring of conduct; when the regard which we pay to the opinions of men, encroaches on that reverence which we owe to the voice of conſcience and the ſenſe of duty; *the love of praiſe* having then gone out of its place, inſtead of *improving*, *corrupts*; inſtead of being a VIRTUE, it becomes a VICE.

SECT. XLV.

ON THE PASSIONS.

Paſſions, like elements, though born to fight,
Yet mix'd and ſoften'd, in his work unite.
LOVE, HOPE, JOY, fair pleaſure's ſmiling train,
HATE, FEAR, and GRIEF, the family of pain;
Theſe mix'd with art, and to DUE BOUNDS confin'd,
Make and maintain the balance of the mind:
The lights and ſhades, whoſe well-accorded ſtrife
Gives all the ſtrength and colour of our life.

POPE.

PASSIONS are ſtrong emotions of the mind, occaſioned by the view of approaching good or evil. They are original parts of the conſtitution of our nature; and therefore to extirpate them is a miſtaken aim. When properly directed they are ſubſervient to very uſeful ends. They rouſe the dormant powers of the ſoul. They are even found to exalt them. They often raiſe a man above himſelf, and render him more penetrating, vigorous, and maſterly, than he is in his calmer hours. Actuated by ſome high *paſſion*, he conceives great deſigns, and ſurmounts all difficulties in the execution. He is inſpired with more lofty ſentiments, and endowed with more perſuaſive utterance, than he poſſeſſes at any other time. *Paſſions* are the active forces of the ſoul. They are its higheſt powers brought into movement and exertion. RELIGION requires no more of us than to *moderate* and *rule them.* For neceſſary as their impulſe is, to give activity in the mind, yet if they are not kept in ſubordination to REASON, they ſpeedily throw all things into confuſion. Like wind and fire, which are inſtrumental in carrying on many of the beneficent operations of nature; when they riſe to undue violence, or deviate from their proper courſe, their path is marked with ruin; ſo are the *paſſions* either uſeful or deſtructive, according to their direction and degree. Ye *impetuous paſſions,* terrible whirlwinds, you excite thoſe tempeſts that drown individuals in perdition; you change innocent pleaſure into debauchery; the feſtive goblet into drunkenneſs; prudence into avarice; caution into cowardice: by you, fathers are induced to take up arms againſt their children, and children againſt their fathers; you drive to ſuicide; you change induſtry into rapine and robbery; it is you, in a word, that occaſion all the diſorder and confuſion in this ſublunary ſtate.

SECT. XLVI.

ON ANGER.

When *reaſon*, like the ſkilful charioteer,
Can break the FIERY PASSIONS to the bit,
And, ſpite of their licentious ſallies, keep
The radiant track of glory;—PASSIONS, then,
Are *aids* and *ornament*.

YOUNG.

WE are, by no means, to imagine, that RELIGION tends to extinguiſh the ſenſe of *honour*, or to ſuppreſs the exertion of a *manly ſpirit*. It is under a falſe apprehenſion of this kind, that *Chriſtian patience* is ſometimes ſtigmatiſed in diſcourſe as no other than a different name for cowardice. On the contrary, every man of virtue ought to feel what is due to his character, and to ſupport properly his own rights. *Reſentment of wrong* is an uſeful principle in human nature; and for the wiſeſt purpoſes was implanted in our frame. It is the neceſſary guard of private rights; and the great reſtraint on the inſolence of the violent, who, if no reſiſtance were made, would trample on the gentle and peaceable.

But in the fulneſs of ſelf-eſtimation, we are too apt to forget what we are. We are rigorous to offences, as if we did not daily intreat heaven for mercy. Nothing is in general ſo inconſiſtent as *anger*. The moſt inconſiderable point of intereſt, or honour, ſwells into a momentous object; and the ſlighteſt attack ſeems to threaten immediate ruin. It overpowers reaſon; confounds our ideas; diſtorts the appearances, and blackens the colour of every object. As it ſwells, it conſtantly juſtifies to our apprehenſions the tumult which it creates, by means of a thouſand falſe arguments which it forms, and brings to its aid. Beware, therefore, and ſuppreſs theſe moments of deluſion. Suſpend your violence, I beſeech you, for an inſtant. Anticipate that period of coolneſs, which, of itſelf, will ſoon arrive. Allow yourſelf to think, how little you have any proſpect of gaining by fierce contention; but how much of true happineſs you are certain of throwing away. Wait until the fumes of *paſſion* be ſpent; until the miſt which it hath raiſed is diſſipated, when you ſhall ſee where truth and right lie; and reaſon ſhall, by degrees, reſume the aſcendant, Did you only preſerve yourſelf compoſed for a moment, you would diſcover the inſignificancy of moſt of thoſe provocations which you magnify ſo highly. When a few ſuns more have rolled over your head, the ſtorm will have, of itſelf, ſubſided; the cauſe of your preſent impatience and diſturbance will be utterly forgotten. Can you not, then, anticipate this hour of calmneſs to yourſelf; and begin to enjoy the peace which it will certainly bring? If others have behaved improperly, leave them to their own folly, ſolly, without becoming the victim of their caprice, and puniſhing yourſelf on their account. To prove that *paſſion* is exorbitant in its demands, what proportion, for inſtance, is there between the life of a man, and an affront received, or ſuppoſed to be given by ſome unguarded expreſſion. How fantaſtic, then, how unjuſtifiable, are thoſe ſuppoſed laws of modern honour, which for ſuch an affront require no leſs reparation than the death of a fellow creature; and which, to obtain this reparation, requires a man to endanger his own life? Laws which, as they have no foundation in reaſon, never received the leaſt ſanction from any wiſe or poliſhed nations of antiquity; but were deviſed in the darkeſt ages of the world, and are derived to us from the ferocious barbarity of Goths and Vandals. Who is there, were he to behold his enemy during that conflict which human nature muſt ſuffer at the laſt, but muſt feel relentings at that animoſity, which hath deprived another of exiſtence.

« There lies the man with whom I contended, « ſilent and mute for ever! How poor is the advantage which I now enjoy! He is fallen, and I « am about to follow him. In a ſhort time we ſhall « be laid together! Had he not his virtues and good « qualities as well as I? When we ſhall both appear « before the judgment-ſeat of God, ſhall I be found « innocent, and free of blame; for all the enmity I « have borne to him?"

My friends, let the anticipation of ſuch ſentiments ſerve now to cool the heat of anger, and allay the fierceneſs of reſentment. Let us look upon this world as a ſtate of trial. Elevated by ſuch ſentiments, our minds will become calm and ſedate. We ſhall look down, as from a ſuperior ſtation, on the petty ſtrifes of this world. They are the ſelfiſh, the ſenſual, and the vain, who are moſt ſubject to the undue influence of *paſſion*. They are linked ſo cloſely to the world; by ſo many ſides they touch every object, and every perſon around them, that they are perpetually hurt, and perpetually hurting others. But the ſpirit of TRUE RELIGION removes us to a proper diſtance from the grating objects of worldly contention. It leaves us ſufficiently connected with the world, for acting our part in it with propriety; but diſengages us from it ſo far, as to weaken its power of diſturbing our tranquillity. It inſpires magnanimity; and magnanimity always breathes *gentleneſs*. It leads us to view the follies of men with pity, and not with rancour; and to treat, with the mildneſs of a ſuperior nature, what in little minds would call forth all the bitterneſs of *paſſion*.

SECT. XLVII.

ON PLEASURE.

A pallid youth, beneath a ſhade,
A melancholy ſcene diſplay'd:
His mangled face, and loathſome ſtains,
Proclaim'd the poiſon in his veins;
He rais'd his eyes, he ſmote his breaſt,
He wept aloud, and thus addreſs'd:

" *Forbear the Harlot's falſe embrace,*
" *Though lewdneſs wear an angel's face:*
" *Be wiſe, by my experience taught;*
" *I die alas! for want of thought.*"

COTTON.

RELIGION is accuſed of inſufferable ſeverity, in prohibiting *enjoyment*; and the old, when they offer their admonitions, are upbraided with having forgot that they once were young. And yet, my friends, to what do the reſtraints of *religion*, and the counſels of *age*, with reſpect to *pleaſure*, amount? They may be all compriſed in a few words, " NOT TO " HURT YOURSELVES, AND NOT TO " HURT OTHERS," by your purſuit of *pleaſure*. Within theſe bounds *pleaſure* is *lawful*; beyond them, it becomes *criminal*, becauſe it is *ruinous*. Are theſe reſtraints any other, than thoſe a wiſe man would chooſe to impoſe on himſelf? *Religion* or *philoſophy*

loſophy calls you not to renounce *pleaſure*, but teaches you how to enjoy it. Inſtead of abridging it, we exhort you to purſue it with ſafety. We propoſe meaſures for ſecuring its poſſeſſion, and for prolonging its duration. Though ſhe may appear to contract the bounds of enjoyment, you will upon reflection find, that in truth ſhe enlarges them: what is delightful in human enjoyment ſhe readily allows, and not only allows, but heightens by that grateful reliſh which a good conſcience gives to every pleaſure, and not only heightens, but adds, when correcting the exceſs of ſome paſſions, ſhe gives room for the growth of others. Amid the turbulence of riot and the fumes of intoxication, unknown are the *pleaſures* of generous friendſhip, heart-felt love, and domeſtic ſociety; unknown the *conſcious ſatisfaction* which accompany honourable purſuits, and the juſtly acquired eſteem of thoſe who ſurround us.

To aim at a conſtant ſucceſſion of high and vivid ſenſations of *pleaſure*, is an idea of happineſs altogether chimerical. Calm and temperate enjoyment is the utmoſt that is allotted to man. Beyond this, we ſtruggle in vain to raiſe our ſtate; and, in fact, depreſs our joys, by endeavouring to heighten them.

Inſtead of thoſe fallacious hopes of perpetual feſtivity, with which the world would allure us, *religion* confers upon us a *cheerful tranquillity*. Inſtead of dazzling us with meteors of joy, which ſparkle and expire, it ſheds around us a *calm and ſteady light*.

Recollect your own feelings. Inquire on what occaſions you have felt the *trueſt ſatisfaction*; whether days intermixed with *pleaſure* and *buſineſs* have not left behind them a more agreeable remembrance, than whole nights of licentiouſneſs and riot.

Look around you on the world; reflect on the different ſocieties which have fallen under your obſervation; and think who among them enjoy life to moſt advantage; whether they who, encircled by gay companions, are conſtantly *fatiguing* themſelves *in queſt* of *pleaſure*; or they to whom *pleaſure* comes *unſought*, in the courſe of active, virtuous, and manly life.

It is an invariable law of our preſent condition, that every *pleaſure* which is purſued to *exceſs*, converts itſelf to a *poiſon*. In all the pleaſures of ſenſe, it is apparent, that only when indulged *within certain limits*, they confer *ſatisfaction*. No ſooner do we paſs the line which temperance has drawn, than pernicious effects come forward and ſhew themſelves. Could I lay open to your view the monuments of death, they would read a lecture on moderation, much more powerful than any that the moſt eloquent writers can give. You would behold the graves peopled with the victims of intemperance. You would behold thoſe chambers of darkneſs hung round, on every ſide, with the trophies of luxury, drunkenneſs, and ſenſuality. So numerous would you find thoſe victims to iniquity, that it may be ſafely aſſerted, where war or peſtilence have ſlain their thouſands, *intemperate pleaſure* has ſlain its ten thouſands.—How long ſhall it be, ere the fate of your predeceſſors in the ſame courſe teach you wiſdom? How long ſhall the experience of all ages continue to lift its voice to you in vain? Beholding the ocean on which you are embarked covered with wrecks, are not thoſe fatal ſignals ſufficient to admoniſh you of the hidden rock?

We all of us have experienced the effects which any indiſpoſition of the body, even though ſlight, produces on external proſperity. Viſit the gayeſt and moſt fortunate man on earth, only with ſleepleſs nights; diſorder any ſingle organ of the ſenſes; corrode but one of his ſmalleſt nerves; and you ſhall preſently ſee all his *gaiety* vaniſh; and you ſhall hear him complain that he is a miſerable creature, and expreſs his envy of the peaſant and the cottager.—And can you believe, that a diſeaſe in the ſoul is leſs fatal to *enjoyment* than a diſeaſe in the animal frame; or that a *ſound mind* is not as eſſential as a *ſound body* to the happineſs of man? Let us rate ſenſual gratifications as high as we pleaſe, we ſhall be made to feel that the ſeat of enjoyment is in the ſoul. The man of moderation alone brings to all the natural and innocent pleaſures, that ſound uncorrupted reliſh, which gives him a much fuller enjoyment of them than the pallid and vitiated appetite of the voluptuary can allow him to know. He culls the flower of every allowable gratification, without dwelling upon it, until its ſweetneſs be loſt.

He ſtops at the point before enjoyment degenerates into diſguſt, and *pleaſure* is converted into *pain.* Moderate and ſimple pleaſure reliſh high with the temperate; whereas it is a great luck, if the voluptuary does not return diſguſted even from a feaſt.—In the pleaſures which are regulated by moderation, beſides, there is always that dignity which goes along with innocence. No man needs to be aſhamed of them. They are conſiſtent with honour; with the favour of God, and of man. But the ſenſualiſt, who diſdains all reſtraint in his pleaſures, is odious in the public eye. His vices become groſs; his character contemptible; and he ends in being a burden both to himſelf and to ſociety.

By unhappy exceſſes, how many amiable diſpoſitions have been corrupted or deſtroyed! how many riſing capacities and powers have been ſuppreſſed! how many flattering hopes of parents and friends have been totally extinguiſhed! Who but muſt drop a tear over human nature, when he beholds that morning which aroſe ſo bright, overcaſt with ſuch untimely darkneſs; that good humour which once captivated all hearts, that vivacity which ſparkled in every company, thoſe abilities which were fitted for adorning the higheſt ſtation, all ſacrificed at the ſhrine of low ſenſuality; and one who was formed for running the fair career of life in the midſt of public eſteem, cut off by his vices at the beginning of his courſe, or ſunk, for the whole of it, into inſignificancy

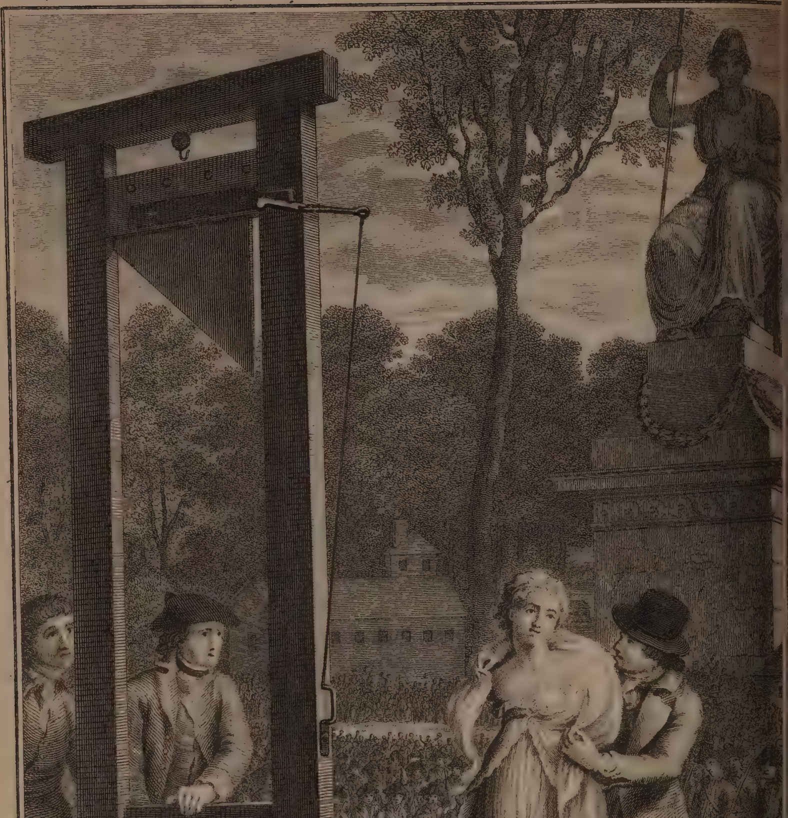
nificancy and contempt!—Theſe, O ſinful Pleaſure, are *thy* trophies!

Retreat, then, from your diſhonourable courſes, ye who by licentiouſneſs, extravagance, and vice, are abuſers of the world! You are degrading, you are ruining yourſelves. You are groſsly miſemploying the gifts of GOD; and miſtake your true intereſt. Awake then to the purſuit of men of virtue and honour. Break looſe from that magic circle, within which you are at preſent held. Reject the poiſoned cup which the enchantreſs Pleaſure holds up to your lips. Draw aſide the veil which ſhe throws over your eyes. You will then ſee other objects than you now behold. You will ſee an abyſs opening below your feet. You will ſee *virtue* and *temperance* marking out the road, which conducts to *true felicity*. You will be enabled to diſcern, that the world is enjoyed to advantage, by none but ſuch as follow thoſe divine guides; and who conſider "*pleaſure as the ſeaſoning, but not as the buſineſs of* "*life.*"

SECT. XLVIII.

ON FORTITUDE.

CHARLOTTE CORDAY was tall and well ſhaped, of the moſt graceful manners and modeſt demeanour: there was in her countenance, which was beautiful and engaging, and in all her movements, a mixture of *ſoftneſs* and *dignity*, which were evident indications of a heavenly mind. She came to Paris, and under a feigned pretext gained admiſſion to that chief of republican tyrants, Marat, in whoſe breaſt ſhe plunged a dagger, acknowledged the deed, and juſtified it by aſſerting that it was a duty ſhe owed her country and mankind to rid the world of a monſter. Her deportment during the trial was *modeſt* and *dignified*. There was ſo engaging a *ſoftneſs* in her countenance, that it was difficult to conceive how ſhe could have armed herſelf with ſufficient intrepidity to execute the deed. Her anſwers to the queſtions of the tribunal were full of *point* and *energy*. She ſometimes ſurpriſed the audience by her *wit*, and excited their admiration by *her eloquence*. Her face ſometimes *beamed* with *ſublimity*, and was ſometimes *covered* with *ſmiles*. She retired while the jury deliberated on their verdict; and when ſhe again entered the tribunal there was a *majeſtic ſolemnity* in her demeanour which perfectly became her ſituation. She heard her ſentence with attention and compoſure; and left the court with *ſerenity*, her mind being long before prepared even for the laſt ſcene. It is difficult to conceive the *heroiſm* which ſhe diſplayed in the way to execution. There was ſuch an air of chaſtened exultation thrown over her countenance, that ſhe inſpired ſentiments of love rather than pity. The ſpectators as ſhe paſſed, uncovered



C.R. Ryley Del.

J. Caldwall

DEATH OF CHARLOTTE CORDAY.

covered their heads before her, and others gave loud tokens of applauſe. She aſcended the ſcaffold with undaunted firmneſs. When the executioner informed her that her feet muſt be tied to the fatal plank ſhe ſubmitted with a *ſmile.* When he took off her handkerchief, the moment before ſhe bent under the fatal ſtroke, ſhe *bluſhed deeply*; and her head, which was held up to the multitude the moment after, exhibited this laſt impreſſion of offended modeſty. A young man of the name of Lux, a commiſſary for Mayence, publiſhed a few days after a pamphlet, in which he propoſed raiſing a ſtatue to her honour, and inſcribing on the pedeſtal, "GREATER THAN BRUTUS." He was confined the next day in priſon, where he did nothing but talk of the example given by Charlotte Corday, and transforming the *guillotine* into an altar, he was only ſolicitous to receive death from the ſame inſtrument by which ſhe had periſhed. As he was leading to execution, he is ſaid to have exclaimed,

Look abroad through nature, to the utmoſt range
Of planets, ſuns, and adamantine ſpheres,
Wheeling unſhaken through the void immenſe;
And ſpeak, O man! does this capacious ſcene
With half that kindling majeſty dilate
Thy ſtrong conception, as when BRUTUS roſe
Refulgent from the ſtroke of CÆSAR's fate,
Amid the crowd of patriots; and his arm
Aloft extending, like eternal Jove
When guilt brings down the thunder, call'd aloud
On Tully's name, and ſhook his crimſon ſteel,
And bade the father of his country hail!
For lo!—*the tyrant proſtrate on the duſt,*
And Rome *again is free!*

PERSONS of a *mild character* are not qualified for diſcharging aright many duties, to which their ſituation may call them. When all is calm and ſmooth around them; when nothing occurs to agitate the mind, or to diſturb the tenor of placid life, they behave with abundance of propriety. They are beloved, and they are uſeful. They promote the comfort of human ſociety; and, by gentleneſs, and courteſy of manners, ſerve to cement men together in agreeable union. But to ſail on the tranquil ſurface of an unruffled lake, and to ſteer a ſafe courſe through a troubled and ſtormy ocean, require *different talents*: and, alas! human life oftener reſembles the ſtormy ocean, than the unruffled lake. We ſhall not have long embarked, without finding the reſemblance to hold too cloſely. The preſent ſtate of man is a mixed ſtate, of comfort and ſorrow, of proſperity and adverſity; neither brightened by uninterrupted ſunſhine, nor overcaſt with perpetual ſhade; but ſubject to alternate ſucceſſions of the one, and the other. Amidſt the buſtle of the world, amidſt the open contentions, and ſecret enmities, which prevail in every ſociety, *mildneſs* and *gentleneſs* alone are not ſufficient to carry us, with honour, through the duties of our different ſtations. Trials ariſe, which demand vigorous exertions of all the moral powers; of patience, vigilance, and ſelf-denial; of conſtancy and fortitude, to ſupport us under danger and reproach; of temperance, to reſtrain us from being carried away by pleaſure; of firm and determined principles, to ſupport us under the different and trying circumſtances of life. Unleſs we be thus armed and fortified, whatever good intentions have been in our heart, they are likely to be fruſtrated in action. *Good nature*, for inſtance, is in danger of running into that unlimited complaiſance, which aſſimilates men to the looſe manners of thoſe whom they find around them. Pliant, and yielding in temper, they have not force to ſtand by the deciſions of their own minds, with regard to right and wrong. Through innocent, but unguarded weakneſs, and from want of the *ſeverer virtues*, they are, in proceſs of time, betrayed into downright crimes. They were equipped for the ſeaſon of ſunſhine and ſerenity; but when the ſky is overcaſt, and the days of darkneſs come, their feeble minds are deſtitute of ſhelter, and ill provided for defence. Then is the time, when more *hardy qualities* are required; when courage muſt face danger, conſtancy ſupport pain, patience poſſeſs itſelf in the midſt of diſcouragements, and magnanimity diſplay its contempt of threatenings. If thoſe *high virtues* be altogether ſtrangers to the mind, the *mild* and *gentle* will certainly ſink under the torrent of diſaſters.

Such are the feelings incident to perſons of mixed and imperfect goodneſs: ſuch are the defects of a character formed merely of the *amiable*, without the *eſtimable qualities* of man.

It becomes us therefore to guard againſt either *too great ſeverity*, or *too great facility* of *manners*. Theſe are *extremes*, of which we every day behold inſtances in the world.

He who leans on the ſide of *ſeverity*, is harſh in his cenſures and narrow in his opinions. He cannot condeſcend to others in things indifferent. He makes no allowance for human frailty; nor believes that

> Virtuous and vitious every man muſt be,
> Few in the extreme, but all in the degree.
> The rogue and fool by fits are fair and wiſe,
> And ev'n *the beſt*, by fits, what *they deſpiſe*.
>
> Pope.

With him, all *gaiety* is ſinful *levity*; and every *amuſement* is a *crime*. To *this extreme* the admonition of Solomon ſeems to belong,

BE NOT RIGHTEOUS OVERMUCH.

Nothing, it muſt be confeſſed, in moral conduct, is more difficult, than to avoid turning either to the *right hand* or the *left*.

One of the greateſt trials both of wiſdom and virtue is, to preſerve a JUST MEDIUM between that *harſhneſs* of *auſterity*, which diſguſts and alienates mankind, and that *weakneſs* of *good-nature*, which opens the door to ſin.

One who is of the *former character*, ſtudies too little to be agreeable, in order to render himſelf uſeful. He who is of the *latter*, by ſtudying too much to be agreeable, forfeits his innocence. If the *one* hurts religion, by clothing it in the garb of unneceſſary ſtrictneſs; the *other*, by unwarrantable compliance, ſtrengthens the power of corruption in the world. *True religion* enjoins us to ſtand at an *equal diſtance* from *both*; and to purſue the *difficult*, but *honourable*, *aim* of uniting *good-nature* with *fixed principles*, and *affable manners* with *untainted virtue*.

SECT. XLIX.

ON CHEERFULNESS.

What bleſſings THY free bounty gives
  Let me not caſt away;
For GOD is paid when man receives,
  T' *enjoy* is to *obey*.

POPE.

As I was betwixt ſleeping and waking, methought on a ſudden I perceived one of the moſt ſhocking figures imagination can frame advancing towards me. She was dreſt in black, her ſkin was contracted into a thouſand wrinkles, her eyes deep ſunk in her head, and her complexion pale and livid as the countenance of death. Her looks were filled with terror and unrelenting ſeverity, and her hands armed with whips and ſcorpions. As ſoon as ſhe came near, with a horrid frown, and a voice that chilled my very blood, ſhe bid me follow her. I obeyed, and ſhe led me through rugged paths, beſet with briars and thorns, into a deep ſolitary valley. Wherever ſhe paſſed the fading verdure withered beneath her ſteps; her peſtilential breath infected the air with malignant vapours, obſcured the luſtre of the ſun, and involved the fair face of heaven in univerſal gloom. Diſmal howlings reſounded through the foreſt, from every baleful tree the night-raven croaked his dreadful note, and the proſpect was filled with deſolation and horror. In the midſt of this tremendous ſcene ſhe addreſſed me in the following manner:

"Retire with me, O raſh unthinking mortal, "from the vain allurements of a deceitful world, "and learn that *pleaſure* was not deſigned the por-"tion of human life. Man was born to *mourn* and "to be *wretched*; this is the condition of all below "the ſtars, and whoever endeavours to oppoſe it, "acts in contradiction to the will of heaven. Fly "then from the fatal enchantments of youth and "ſocial delight, and here conſecrate the ſolitary "hours to lamentation and woe. *Miſery* is the duty "of all ſublunary beings, and every *enjoyment* is an "*offence* to the DEITY, who is to be worſhipped "only by the mortification of every ſenſe of plea-"ſure, and the everlaſting exerciſe of ſighs and "tears."

This melancholy picture of life quite ſunk my ſpirits, and ſeemed to annihilate every principle of happineſs within me. I threw myſelf beneath a blaſted yew, where the winds blew cold and diſmal round my head, and dreadful apprehenſions chilled my heart. Here I reſolved to lie till the hand of death, which I impatiently invoked, ſhould put an end to the miſeries of a life ſo deplorably wretched. In this ſad ſituation I ſpied on one hand of me a deep muddy river, whoſe heavy waves rolled on in ſlow and ſullen murmurs, when I found myſelf ſuddenly ſurpriſed by the ſight of the lovelieſt object I ever beheld. The moſt engaging charms of youth and beauty appeared in all her form; effulgent glories ſparkled in her eyes, and their awful ſplendours were ſoftened by the gentleſt looks of compaſſion and peace. At her approach, the frightful ſpectre, who had before tormented me, vaniſhed away, and with her all the horrors ſhe had cauſed. The gloomy clouds brightened into cheerful ſun-ſhine, the groves recovered their verdure, and the whole region looked gay and blooming as the garden of Eden. I was quite tranſported at this unexpected change, and reviving hope began to glad my thoughts, when, with a look of inexpreſſible ſweetneſs, my beauteous deliverer thus uttered her divine inſtructions:

"My name is RELIGION. I am the offspring "of Truth and Love, and the parent of Benevo-"lence, Hope, and Joy. That monſter from "whoſe power I have freed you is called SUPER-"STITION; ſhe is the child of Discontent, and "her followers are Fear and Sorrow. Thus, dif-"ferent as we are, ſhe has often the inſolence to "aſſume *my name* and *character*, and ſeduces un-"happy mortals to think us the *ſame*, till ſhe at "length drives them to the borders of deſpair, that "dreadful abyſs into which you were juſt going to "ſink.

"Look around and ſurvey the various beauties of

" the globe, which heaven has deſtined for the ſeat " of the human race, and conſider whether a world " thus exquiſitely framed could be meant for the " abode of miſery and pain. For what end has the " laviſh hand of PROVIDENCE diffuſed ſuch innu- " merable objects of delight, but that all might " *rejoice* in the privilege of exiſtence, and be filled " with gratitude to the beneficent Author of it? " Thus to enjoy the bleſſings he has ſent, is virtue " and obedience; and to reject them merely as " means of pleaſure, is pitiable ignorance, or abſurd " perverſeneſs. Infinite goodneſs is the ſource of " created exiſtence; the proper tendency of every " rational being, from the higheſt order of raptured " ſeraphs, to the meaneſt rank of men, is to riſe " inceſſantly from lower degrees of happineſs to " higher. They have each faculties aſſigned them " for various orders of delights."

" What," cried I, " is this the language of RE- " LIGION? Does ſhe lead her votaries through " flowery paths, and bid them paſs an unlaborious " life? The *true enjoyments* of a reaſonable being," anſwered ſhe mildly, " do not conſiſt in *unbounded* " *indulgence*, or *luxurious eaſe*, in the *tumult* of *paſ-* " *ſions*, the *languor* of *iudulgence*, or the *flutter* of " *light amuſements*. Thoſe are often raiſed into the " *greateſt tranſports* of *joy* who are ſubject to the " *greateſt depreſſions* of *melancholy*: on the contrary, " CHEERFULNESS, though it does not give the " mind ſuch an exquiſite gladneſs, prevents us from " falling into any depths of ſorrow. MIRTH is like

" a flaſh

" a flaſh of lightning, that breaks through a gloom " of clouds, and glitters for a moment; CHEERFULNESS keeps up a kind of day-light in the mind, " and fills it with a ſteady and perpetual ſerenity.

" If we conſider cheerfulneſs in three lights,

" 1. *With regard to ourſelves,*
" 2. *To thoſe we converſe with,* And
" 3. *To the great Author of our being,*

" it will not a little recommend itſelf on each of " theſe accounts.

1. " The man who is poſſeſſed of *this excellent* " *frame of mind* is not only eaſy in his thoughts, but " a perfect maſter of all the powers and faculties of " the ſoul: his imagination is always clear, and his " judgment undiſturbed: his temper is even and " unruffled, whether in action or ſolitude. He " comes with a reliſh to all thoſe goods which " nature has provided for him, taſtes all the pleaſures of the creation which are poured about him, " and does not feel the full weight of thoſe accidental evils which may befal him.

2. " If we conſider him *in relation to the perſons* " *whom he converſes with,* it naturally produces love " and good-will towards him. A CHEERFUL MIND " is not only diſpoſed to be affable and obliging, " but raiſes the ſame good humour in thoſe who " come within its influence. A man finds himſelf " pleaſed, he does not know why, with the cheerfulneſs of his companion: it is like a ſudden ſunſhine, that awakens a ſecret delight in the mind,

" without her attending to it. The heart rejoices of " its own accord, and naturally flows out into friend" ſhip and benevolence towards the perſon who has " ſo kindly an effect upon it.

3. " When I conſider this CHEERFUL STATE OF " MIND in its third relation, I cannot but look upon " it as a *conſtant habitual gratitude* to the great AU" THOR of NATURE. An *inward cheerfulneſs* is an " implicit praiſe and thankſgiving to PROVIDENCE " under all its diſpenſations. It is a kind of ac" quieſcence in the ſtate wherein we are placed, and " a ſecret approbation of the *Divine Will* in his con" duct towards man."

Such conſiderations as theſe we ſhould perpetually cheriſh in our thoughts; they will baniſh from us all that ſecret heavineſs of heart which unthinking men are ſubject to when they lie under no real affliction, all that anguiſh which we may feel from any evil that actually oppreſſes us, to which I may likewiſe add thoſe little cracklings of mirth and folly, that are apter to betray virtue than ſupport it; and eſtabliſh in us ſuch an EVEN and CHEERFUL TEMPER, as makes us pleaſing—to *ourſelves*—to *thoſe* with whom we converſe, and—to *him* whom we are made to pleaſe.

CHEERFULNESS is in the next place the beſt promoter of *health*. Repinings and ſecret murmurs of heart give imperceptible ſtrokes to thoſe delicate fibres of which we are compoſed, and wear out the machine inſenſibly; not to mention the injury they do the blood, and thoſe irregular diſturbed motions which they raiſe in the vital functions. I ſcarce remember in my own obſervation, to have met with many old men, or with ſuch, who (to uſe our Engliſh phraſe) wear well, that had not at leaſt a certain calmneſs in their humour, if not a more than ordinary gaiety and cheerfulneſs of heart.

CHEERFULNESS bears the ſame friendly regard to the *mind* as to the *body*; it baniſhes all anxious care and diſcontent, ſoothes and compoſes the paſſions, and keeps the ſoul in a perpetual calm.

There are writers of great diſtinction who have made it an argument for PROVIDENCE, that the whole earth is covered with *green* rather than with any other colour, as being ſuch a right mixture of light and ſhade, that it comforts and ſtrengthens the eye inſtead of weakening or grieving it. For this reaſon ſeveral painters have a green cloth hanging near them to eaſe the eye upon, after too great an application to their colouring. A famous modern philoſopher accounts for it in the following manner: "*All colours that are more luminous, overpower and* "*diſſipate the animal ſpirits which are employed in* "*ſight:—on the contrary, thoſe that are more obſcure* "*do not give the animal ſpirits a ſufficient exerciſe;* "*whereas the rays that produce in us the idea* "*of green, fall upon the eye in ſuch a due proportion,* "*that they give the animal ſpirits their proper play,* "*and, by keeping up the ſtruggle in a juſt balance, excite* "*a very pleaſing and agreeable ſenſation.*" Let the cauſe be what it will, the effect is certain; for which reaſon the poets aſcribe to this particular colour the epithet of *cheerful.*

To conſider further this double end in the works of NATURE, and how they are, at the ſame time, both uſeful and entertaining, we find that the moſt *important* parts in the vegetable world are thoſe which are the moſt *beautiful.* Theſe are the ſeeds by which the ſeveral races of plants are propagated and continued, and which are always lodged in flowers or bloſſoms. NATURE ſeems to hide her principal deſign, and to be induſtrious in making the earth gay and delightful, while ſhe is carrying on her great work, and intent upon her own preſervation. The huſbandman, after the ſame manner, is employed in laying out the whole country into a kind of garden or landſcape, and making every thing ſmile about him, whilſt in reality he thinks of nothing but of the harveſt, and increaſe which is to ariſe from it.

We may further obſerve how PROVIDENCE has taken care to keep up this *cheerfulneſs* in the mind of man, by having formed it after ſuch a manner as to make it capable of conceiving delight from ſeveral objects which ſeem to have very little uſe in them, as from the wildneſs of rocks and deſerts, and the like groteſque parts of nature. In ſhort, the whole univerſe is a kind of theatre filled with objects that either raiſe in us pleaſure, amuſement, or admiration.

The reader's own thoughts will ſuggeſt to him the viciſſitude of day and night, the change of ſeaſons, with all that variety of ſcenes which diverſify the face of nature, and fill the mind with a perpetual ſucceſſion of beautiful and pleaſing images. I ſhall omit to mention the ſeveral entertainments of *art*, with the pleaſures of *friendſhip*, *books*, *converſation*, and other *accidental diverſions* of life, becauſe I would only take notice of ſuch incitements to a *cheerful temper*, as offer themſelves to perſons of *all ranks* and *conditions*, and which may *ſufficiently ſhew us*, that PROVIDENCE did not deſign *this world* ſhould be filled with *murmurs* and *repinings*, and that the heart of man ſhould be involved in perpetual *gloom* and *melancholy*.

SECT. L.

THE REWARD OF ATTENTION TO THE LAWS OF THE ANIMAL OECONOMY.

THE man who is attentive to the maxims of health, which we have before delivered,

Will proſper like the ſlender reed,
Whoſe top waves gently o'er the mead;
And move, ſuch bleſſings virtue follow,
In *Health*, and Beauty, an Apollo.

Like dew drops from the cryſtal ſtream,
Will his eyes with pearly luſtre beam;
And with marks of firm health o'erſpread,
His cheeks ſurpaſs the morning's red.

The faireſt of the female train
For him ſhall bloom, nor bloom in vain:
O happy ſhe, whoſe lips he preſſes!
O happy ſhe, whom he careſſes!

PATHOLOGY.

PRACTICAL OBSERVATIONS.

SECT. LI.

OF THE SYMPTOMS DENOTING DISEASE.

Having fully ſhewn what it is that conſtitutes health, we now proceed to *pathology*, or that part of phyſic which treats of the morbid ſtate of the human body.

If we attend to the nature of diſeaſes, we ſhall find that they always conſiſt of different kinds of diſtreſs or inability; for let us examine any perſon who is ill, it matters not of what diſtemper, and we ſhall conſtantly perceive that there is more than one complaint.

Theſe complaints, when regarded ſingly, are all termed in the medical language *ſymptoms.*

Hence we may underſtand what the authors mean, when they tell us that a diſeaſe is an aſſemblage or combination of ſymptoms.

As the analytic method, which begins by reſolving things, as far as may be, into their conſtituent parts, and then examining theſe in the ſeparate ſtate, is the way that has led to the moſt important diſcoveries which have been made in natural philoſophy, let us adopt it, in order, if poſſible, to find out the true nature of diſeaſes; and ſince ſymptoms are the component parts of diſeaſes, let us firſt attempt to inveſtigate them.

We ſhall readily aſcertain the number of general ſymptoms, by firſt obſerving the ſeveral conditions which reſult from the general regularity of the animal œconomy, and then by conſidering the deviations from, or the oppoſites to, theſe conditions.

Signs of Health.	Symptoms of Diſeaſe.
I. *When the degree of animal heat is ſuch, that it neither falls below nor riſes above what gives a pleaſant and agreeable ſenſation.*	*The two extremes of the mean, or a pleaſant moderate warmth, is an uneaſy ſenſation of exceſſive heat, or great coldneſs: hence ariſe two marking ſymptoms,* 1ſt. *A ſenſe of heat.* 2d. *A ſenſe of cold.*
II. *When the appetite reliſhes its objects, and returns in moderation at the proper ſeaſons and intervals.*	*The deviation from, or the oppoſites to, a natural appetite, is a diſreliſh or loathing of the proper objects: whence ariſe a third, fourth, and fifth,* viz. 3d. *A loathing of certain foods, or abſolute ſickneſs.* 4th. *Thirſt.* 5th. *An inſatiable appetite.*

III. *When*

Signs of Health.	Symptoms of Diſeaſe.
III. *When there is no pain, or feel as if we were compoſed of different organs or parts.*	6th. *Uneaſy ſenſation, or actual pain, calling the attention of the mind to ſome one part.*
IV. *When ſleep is natural and refreſhing.*	7th. *Reſtleſſneſs, or inability to ſleep.* 8th. *A propenſity to be ever dropping aſleep.*
V. *When there is no ſenſe of ſtraitneſs or oppreſſion in the action of breathing.*	9th. *A ſenſe of oppreſſion about the cheſt, producing anxiety.* 10th. *Breathing oppreſſed, or* 11th. *Painful.*
VI. *When the voluntary motions depending upon the exertion of the muſcles can be performed agreeably to the will, with eaſe, readineſs, and a due degree of force.*	12th. *Weakneſs, or muſcular debility.* 13th. *Spaſm, or convulſion.*
VII. *When the feeling is natural, and the ſeveral organs of external ſenſe receive and tranſmit the different impreſſions to which they are peculiarly adapted, in the juſt degree.*	14th. *Inſenſibility to external objects.* 15th. *A too high degree of ſenſibility.*

VIII. *And,*

Signs of Health.	Symptoms of Diſeaſe.
VIII. *And, laſtly, when the organs of internal ſenſe are all in that natural ſtate which enables the mind to perceive clearly, and judge truly concerning the impreſſions which are made, or of the ideas which ariſe in conſequence of the powers of memory and imagination.*	16th. *A diſorder of the internal ſenſes.* *This happens when the faculties of the mind cannot be properly exerciſed, and the ſeveral powers of memory, imagination, and judgment, are weakened, confuſed, or perverted.*

Each of theſe ſixteen ſpecies of morbid diſtreſs or affection, may be conſidered in the abſtract as capable of exiſting, one independent of another; but whenever they do exiſt, they affect the whole frame, and diſturb the general regularity of the animal œconomy; hence we have called them general ſymptoms, in order to diſtinguiſh them from thoſe ſlight affections which are only tranſient, and ſpring from ſome trifling diſorder of the body. As, for example, the lungs may be diſturbed in their action by a cough, raiſed by the irritation of ſomewhat either about the larynx, or lower down in the trachea; or the little ducts and orifices, which are naturally deſtined to ooze out lymph and mucus, to lubricate the inteſtines, may be irritated ſo as to pour out an unuſual quantity of theſe humours, and thus give riſe to a looſeneſs: but this cough, unleſs it be accompanied with other ſymptoms, ſuch as pain, difficulty of breathing, reſtleſſneſs, or loſs of appetite, will not deſerve the name of diſeaſe, and the perſon affected will ſcarcely apply for medical aſſiſtance; neither would the ſlight diarrhœa or looſeneſs be reckoned a diſeaſe, unleſs it were attended with ſome one or more of the ſixteen general ſymptoms, ſince we know for certain that ſo long as every one of theſe ſixteen complaints can be kept off, ſo long will the body remain free from any very important diſorder *.

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* The great Dr. Darwin has thought fit to deviate from this rule, and has made every aberration from common or natural action a ſpecies of diſeaſe. Hence we find among the catalogue of his diſeaſes, drunkenneſs, febrile heat, warm ſweats, ſweat from labour, ſweat from ſitting near a large fire, the diſcharge from a bliſter, even the healing of ulcers, ſurpriſe, coldneſs of fever, grey hairs, hunger, deglutition, reſpiration, ſneezing, panting, delirium of fever, dreams, bluſh from heat, from joy, diſtention of the nipples, folly from inſenſibility, want of appetite, reſtleſſneſs, febrile trembling, reverie, ſentimental love, vanity, pride of family, anger, rage, pity, heroic education, fatigue, ſleep, credulity, fluſhing of the face after dinner, ſweat from covering the face in bed, cure of ſickneſs by ſtimulating the ſkin, tooth-edge, biting the nails, life of an egg, life of winter-ſleepers, electric ſhock through the arm, oxygenation of the blood, ſoft pulſe in vomiting, trembling from anger, redneſs from anger, bluſh of guilt, ſlowneſs of old age, periods of ſleep, diabetes from fear, nauſea from ideas, vomiting from tickling the throat, &c. a plan which we have not adopted for the reaſons above aſſigned, but when differing from ſuch high authority, we beg leave at the ſame time to confeſs the ingenuity of the plan, and to refer the reader for an explanation of many of the phænomena attendant upon life to the Zoonomia, or its laws.

As certain ſymptoms, both general and local, are uſually obſerved to combine, and accompany each other (becauſe they flow from ſimilar changes in the ſtate of the animal motions); theſe *aſſemblages* are diſtinguiſhed by different names, ſuch as fever, pleuriſy, dyſentery, and ſo forth, thus making up the entire catalogue of diſeaſes.

The knowing how to diſtinguiſh theſe *combinations*, and the *ſources* from whence they ſpring, is the true foundation of *rational practice*; becauſe, in our attempts to relieve ſick people, we ſeldom regard particular ſymptoms, or any ſingle ſpecies of the diſtreſs, but rather, having found out the ſource of the whole aſſemblage, ſtrike at the root, and endeavour to rectify what is amiſs with reſpect to the animal motions.

PRACTICAL OBSERVATIONS.

SECT. LII.

OF THE CLASSIFICATION OF DISEASE.

Nosologists erect imaginary boundaries between things which are of an homogeneous nature. They degrade the human underſtanding, by ſubſtituting ſimple perceptions, to its more dignified operations of judgment and reaſoning. They gratify indolence in a phyſician, by fixing his attention upon the name of a diſeaſe, and thereby leading him to neglect the varying ſtate of the ſyſtem. They moreover lay a foundation for diſputes among phyſicians, by diverting their attention from the ſimple prediſpoſing and proximate, to the numerous, remote, and exciting cauſes of diſeaſes, or to their more numerous and complicated effects. The whole materia medica is infected with the baneful conſequences of the nomenclature of diſeaſes; for every article in it is pointed only againſt their names, and hence the origin of the numerous contradictions among authors who deſcribe the virtues and doſes of the ſame medicines. By the rejection of the artificial arrangement of diſeaſes, a revolution muſt follow in medicine. Obſervation and judgment will take the place of reading and memory, and preſcriptions will be conformed to exiſting circumſtances. The road to knowledge in medicine by this means will likewiſe be ſhortened; ſo that a young man will be able to qualify himſelf to practiſe phyſic at as much leſs expenſe of time and labour than formerly, as a child would learn to read and write by the help of the Roman alphabet, inſtead of Chineſe characters.

Medicine has certainly much to deplore from this multiplication of diſeaſes. It is as repugnant to truth in medicine, ſays Ruſh, as polytheiſm is to truth in religion. The phyſician who conſiders every different affection of the different ſyſtems in the body, or every affection of different parts of the ſame ſyſtem, as diſtinct diſeaſes, when they ariſe from one cauſe, reſembles the Indian or African ſavage, who conſiders water, dew, ice, froſt, and ſnow, as diſtinct eſſences: while the phyſician who conſiders the morbid affections of every part of the body, (however diverſified they may be in their form or degrees) as derived from one cauſe, reſembles the philoſopher, who conſiders dew, ice, froſt, and ſnow, as different modifications of water, and as derived ſimply from the abſence of heat.

If the immediate cauſes of the ſixteen general ſymptoms were not ſo few, the number of diſeaſes which might reſult from their poſſible combination with each other, would amount to ſomewhat beyond the reach of common apprehenſion; but ſince intenſeneſs or remiſſneſs, irregularity or ſuſpenſion, of the motions in either nervous or vaſcular ſyſtem, give riſe to every one of the ſymptoms which are found, more or leſs, in all diſeaſes whatever, ſome of the ſixteen, as depending on ſimilar circumſtances, muſt unavoidably concur, and always run together in the ſame aſſemblage; and hence it is, that all the diſeaſes which afflict the human body, can be reduced to a moderate number of claſſes.

As to diſtinctions into genera, ſpecies, and varieties, they may be extended to many hundreds; but, as will hereafter appear, ſo many ſubdiviſions are not abſolutely neceſſary for practice, though they are indiſpenſably ſo, whenever it is attempted to write hiſtories of diſeaſes *.

In thus rejecting the noſologies of the ſchools, I do not, however, wiſh to ſee them baniſhed from the libraries of phyſicians.

To all thoſe who wiſh to become acquainted with the arrangement of diſeaſes by the illuſtrious Dr. Cullen, and the method of ſcientific teaching of phyſic, by treating ſpecifically of each diſeaſe, dividing them into their claſſes, orders, genera, ſpecies, and varieties, with the remote, prediſponent, occaſional, and proximate cauſes of each diſeaſe, and the indications of cure, we would ſtrongly recommend the Elements of Therapeutics, or Guide to Health, by the Rev. Mr. Townſend.

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* Thoſe who wiſh to acquire this minute knowledge, we refer to the inimitable work of the illuſtrious Sauvage.

We have, however, followed Dr. BROWN's method with ſome variations, conſidering it as moſt ſimple; ſince by bringing thoſe diſeaſes together which demand ſimilar remedies [*], it proves that however noſologiſts have multiplied names, there is truly ſpeaking but two diſeaſes, or oppoſite ſtates of the conſtitution, each of which requires its own treatment. In our work we, therefore, propoſe marſhalling out diſeaſes into three grand claſſes, or diviſions, viz.

I. STHENIC DISEASES [†].

II. ASTHENIC DISEASES [‡].

III. ANIMAL AND VEGETABLE POISONS [§].

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[*] The defect of Cullen's ſyſtem is the claſſing together the moſt oppoſite diſeaſes; thus ſimple inflammatory fever is placed together with typhus, or putrid fever, as ſpecies of the ſame genus, as is alſo the common quinſey, with the malignant ſore throat; catarrh is companion with dyſentery, and hydrophobia with colic, and hydrothorax with rickets, and ſcrophula with chloroſis, jaundice, and ſyphilis, and pſora, the itch, with a fracture of a bone, &c. How different this arrangement from the ſimple method we have adopted, and how confounding muſt it be to the medical writer, who is obliged to treat ſeparately of each diſeaſe!

[†] Or, diſeaſes of ſtrength, from σθενος, force.

[‡] Or, diſeaſes of weakneſs, from ασθενεια, weakneſs. This was the two-fold diviſion of Brown.

[§] Including moſtly infectious diſorders, ſeparated from the reſt chiefly on the ground of *Pneumatic Philoſophy.*

CLASS FIRST.

STHENIC DISEASES.

PRACTICAL OBSERVATIONS.

SECT. LIII.

PHRENÍTIS *;

OR,

INFLAMMATION OF THE BRAIN.

THE diſtinguiſhing ſigns of this diſeaſe are,

1. A furious delirium.
2. Redneſs and turgeſcence of the face and eyes.
3. Impatience of light and noiſe.
4. A quick, hard, and generally ſteady pulſe, ſometimes however very full.
5. The fever very high.
6. Conſtant wakefulneſs.
7. Reſtleſſneſs.
8. Great increaſe of muſcular ſtrength.
9. Head-ach, violent.

We are not to confound the delirium, which is a common ſymptom in many fevers, with the original inflammation of the brain, which will readily be diſtinguiſhed by obſerving, that in the phrenitis the delirium is evident, and violent, before there be any

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* From φρην, the mind.

remarkable degree of fever; whereas, in the common febrile delirium, the diſeaſe is always of ſome days continuance before the delirium is obſervable, and the degree of raving is correſpondent to the degree of fever: but in the true phrenſy the degree of fever is never correſpondent to the delirious fury, which is equal to what we meet with in real madneſs, from which the inflammation of the meninges is hardly to be diſtinguiſhed but by the ſhortneſs of its duration; for it muſt terminate either in recovery or death, in the ſpace of a very few days.

The original or true phrenſy is not a common diſeaſe in theſe temperate climates; but in the hot countries, where people are often expoſed to the ſun, and incautious of defending the head from the ſcorching heat, the veſſels in that part are frequently ſo weakened and irritated, that they give way to the force of the fluids, and become the ſeat of an inflammation, which very ſeldom admits of a favourable criſis, as one may readily conceive, from conſidering the delicacy of the affected veſſels, and their importance in the animal œconomy.

Sauvage, by dividing inflammations into *membranaceæ* and *parenchymatoſæ*, was here under the neceſſity of making two diſtinct genera, *phrenitis* and *cephalitis*; and he ſplits theſe into no leſs than twenty-four ſpecies; intending, by the firſt, thoſe caſes wherein only the meninges is inflamed; and, by the ſecond, thoſe wherein the ſubſtance of the brain and cerebellum become the ſeat of the diſeaſe.

Theſe diſtinctions, with reſpect to practice, are totally ſuperfluous, as being only different ſtages of the ſame diſeaſe; for the phrenitis, before the patient dies, will generally run on till it becomes a cephalitis.

The termination of phrenitis, if it does not ſoon reſolve itſelf, is an incurable mania, or idiotiſm.

PRACTICAL OBSERVATIONS.

SECT. LIV.

APOPLÉXIA*;

OR,

APOPLEXY.

This diſorder is marked,

1. By a ſudden privation of all the powers of ſenſe and voluntary motion.
2. The joints remain flexible, and the muſcles flaccid.
3. The perſon affected ſeems to be in a moſt profound ſleep, with a ſonorous breathing, or ſnoring.

We may diſtinguiſh a fit of apoplexy from that of ſwooning by obſerving the pulſe and reſpiration. In apoplectic caſes,

4. The pulſe is always ſtrong and full.
5. The countenance is fluſhed for the moſt part, and always looks full and feels warm.

Whereas in ſyncope,

1. The pulſe is either greatly weakened, or not to be felt at all.

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[*] From αποπληξειν, to ſtrike down.

2. The breathing is not obſervable.
3. The countenance falls.
4. Redneſs forſakes the lips, and
5. The fleſh feels cold.

In general, apoplexy ſeizes people who are inclined to be corpulent, have a florid complexion, are full of blood, with ſhort necks, and who indulge too freely in the pleaſures of the table, without taking proper exerciſe. And what makes me more eſpecially place this diſeaſe among the ſthenic is, that there is always reaſon to ſuſpect an oppreſſed brain, and the rupture of a veſſel is the uſual conſequence, or the ſuffuſion of ſerum, which produces palſy of the nervous ſyſtem *.

The reader will pleaſe to obſerve that all ſthenic diſeaſes in their ſequel become aſthenic, hence the puzzlings they have created to ſyſtematic noſologiſts, and the error which noſology introduces into practice. In our method we avoid all this, and follow the path of nature. We ſhall trace here in their order ſthenic diſeaſes, commencing from the head, and ſo going downwards, until we arrive at the extremities, remarking the ſequels of each.

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* John Hunter, who paid much attention to this ſubject, in all the caſes he diſſected at St. George's hoſpital, found a coagulum of blood, or ſuffuſed ſerum. Vide Dr. Bayley's Morbid Anatomy.

PRACTICAL OBSERVATIONS.

SECT. LV.

HYDROCÉPHALUS;

OR,

DROPSY OF THE BRAIN.

Having, ſays Dr. Ruſh, for many years been unſucceſsful in all the caſes, except two, of internal dropſy of the brain, which came under my care, I began to entertain doubts of the common theory of this diſorder, and to ſuſpect that the effuſion of water ſhould be conſidered only as the effect of a primary inflammation, or congeſtion of blood in the brain.

I mentioned this opinion to my colleague Dr. Wiſtar in the month of June 1788, and delivered it the winter following in my lectures. The year afterwards I was confirmed in it by hearing that the ſame idea had occurred to Dr. Quin. I have ſince read Dr. Quin's treatiſe on the dropſy of the brain with great pleaſure, and conſider it as the firſt dawn of light which has been ſhed upon the theory of this diſorder. In purſuing this ſubject, therefore, I ſhall avail myſelf of Dr. Quin's diſcoveries, and endeavour to arrange the facts and obſervations I have collected in ſuch a manner, and to form a connected theory from them, which I hope will lead to a new and more ſucceſsful mode of treating this diſeaſe.

I ſhall begin this inquiry by delivering a few general propoſitions.

1. The internal dropſy of the brain is a diſorder confined chiefly to children.

2. In children the brain is larger in proportion to other parts of the body, than it is in adults; and of courſe a greater proportion of blood is ſent to it in childhood than in the ſubſequent periods of life.—The effects of this determination of blood to the brain appear in the mucous diſcharge from the noſe, and in the ſores on the head and behind the ears, which are ſo common in childhood.

3. In all febrile diſeaſes there is a preternatural determination of blood to the brain. This occurs in a more eſpecial manner in children; hence the reaſon why they are ſo apt to be affected by convulſions in the eruptive fever of the ſmall-pox, in dentition, in the diſeaſes from worms, and in the firſt paroxyſm of intermitting fevers.

4. In fevers of every kind, and in every ſtage of life, there is a diſpoſition to effuſion in that part to which there is the greateſt determination. Thus in inflammatory fever, effuſions take place in the lungs and in the joints. In the bilious fever they occur in the liver, and in the gout in every part of the body. The matter effuſed is always influenced by the ſtructure of the part in which it takes place.

Theſe propoſitions being premiſed, I ſhould have proceeded to mention the remote cauſes of this diſorder; but as this inquiry may poſſibly fall into the hands of ſome gentlemen who may not have acceſs to the deſcription of it as given by Dr. Whytt, Dr. Fothergill, and Dr. Quin, I ſhall introduce a hiſtory of its ſymptoms taken from the laſt of thoſe authors. I prefer it to the hiſtories by Dr. Whytt and Dr. Fothergill, as it accords moſt with the ordinary phænomena of this diſorder.

1. In general the patient is at firſt inactive.
2. Often drowſy and peeviſh.
3. The ſkin is obſerved to be hot and dry towards the evening.
4. There is a ſharp head-ach chiefly in the fore-part, or, if not there, generally in the crown of the head, or one ſide.
5. The head is often inclined to the ſide affected.
6. The patient at this period diſlikes light.
7. Whines much.
8. Sleeps uneaſy.

When the ſymptoms abovementioned have continued for a few days,

9. The axis of one eye is generally found to be turned in towards the noſe.
10. The pupil on this ſide is rather more dilated than the other.
11. If both eyes are ſimilarly affected the pupils are enlarged.
12. The head-ach becomes more excruciating.

13. Pyrexia now increaſes, the pulſe is frequent, breathing quick, exacerbations of the fever take place towards evening, and the face is occaſionally fluſhed; uſually one cheek is much more affected than the other.

14. Temporary perſpirations break out bringing no relief.

15. Delirium, and that of the moſt violent kind, particularly if the patient has arrived at the age of puberty, now takes place.

The diſeaſe, if not reſolved, then undergoes that remarkable change, which ſometimes ſuddenly points out the commencement of what has been called its ſecond ſtage: the pulſe becomes ſlow but unequal, both as to its ſtrength, and the intervals between the pulſations; the pain of the head, or of whatever part had previouſly been affected, ſeems to abate, or at leaſt the patient becomes apparently leſs ſenſible of it; the interrupted ſlumbers, or perpetual reſtleſſneſs which prevailed during the earlier periods of the diſorder, are now ſucceeded by an almoſt lethargic torpor, the ſtrabiſmus, and dilatation of the pupil increaſe, the patient lies with one, or both eyes half cloſed, which, when minutely examined, are often found to be completely inſenſible to light; the vomiting ceaſes; whatever food or medicine is offered is uſually ſwallowed with apparent voracity; the bowels at this period generally remain obſtinately coſtive.

If every effort made by art fails to excite the ſinking powers of life, the ſymptoms of what has been called the ſecond ſtage are ſoon ſucceeded by others, which more certainly announce the approach of death.—The pulſe again becomes equal, but ſo weak and quick, that it is almoſt impoſſible to count it; a difficulty of breathing, nearly reſembling the *Stertor Apoplecticus*, is often obſerved; ſometimes the eyes are ſuffuſed with blood, the fluſhing of the face is more frequent than before, but of ſhorter duration, and followed by a deadly paleneſs; red ſpots, or blotches, ſometimes appear on the body and limbs; deglutition becomes difficult, and convulſions generally cloſe the ſcene. In one caſe, I may obſerve, the jaws of a child of four years of age were ſo firmly locked for more than a day before death, that it was impoſſible to introduce either food or medicine into his mouth; and in another caſe, an hæmiplegia, attended with ſome remarkable circumſtances, occurred during the two days preceding diſſolution.

PRACTICAL OBSERVATIONS.

SECT. LVI.

OPHTHÁLMIA *;

OR,

INFLAMMATION OF THE EYES.

THIS diſeaſe is ſeated generally in the adnata, or whites of the eye.

1. The veſſels which before only allowed the paſſage of ſerum now admit of red globules.
2. There is great pain, eſpecially upon moving the balls of the eye.
3. There is a frequent effuſion of tears.

When the affection of the adnata is conſiderable, the inflammation is not unfrequently communicated to the ſubjacent membranes of the eye, and even to the retina itſelf, which acquires ſo great a ſenſibility, that

4. The ſlighteſt impreſſion of light becomes intolerable.

Oculiſts have multiplied diſeaſes of the eye and parts ſurrounding, without end. Dr. Rowley has lately

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* From οφθαλμος, the eye.

lately publiſhed a work, giving names and remedies for one hundred and eighteen principal diſeaſes in the eyes and eyelids; but however one may admire his ingenuity, we ſhall not follow him in ſplitting of hairs, for, as Cullen juſtly obſerves, ſuch diviſions are idle, if not hurtful; for all caſes of inflammation of the membranes differ only in their intenſity, as blue varies from azure to indigo, and are to be cured by remedies of the ſame kind more or leſs employed.

The inflammation of the eye ſometimes produces a thickening of the thin membrane covering the eye, general or partial, creating blindneſs from the opacity of the cornea, and when the ſuffuſion of lymph is internal, coating the retina, and obſtructing the impulſe of light on it; and the cryſtalline lens is ſometimes rendered obſcure from the ſame cauſe, and at times the ball of the eye itſelf ſuppurates, and, corroding every part, obliterates the whole, leaving only an empty ſocket.

PRACTICAL OBSERVATIONS.

SECT. LVII.

ERYSIPELAS *;

OR,

SAINT ANTHONY'S FIRE.

THE Eryſipelas of the face comes on,

1. With a cold ſhivering, after which ſucceeds,
2. The hot ſtage, which is frequently attended,
3. With confuſion of the head, or delirium.
4. Drowſineſs, ſometimes,
5. Coma,
6. Pulſe frequent, commonly full and hard.

When theſe ſymptoms have continued for one, two, or at moſt three days, there appears

7. A redneſs covering the face, not very vivid, readily diſappearing upon preſſure, but quickly returning again.
8. This redneſs gradually ſpreads from the part it firſt occupied to the other parts of the face,

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* From εϱυειν, to draw, and πελας, near, becauſe it affects the neighbouring parts.

commonly till it ſpreads over the hairy ſcalp, or deſcends upon ſome part of the neck.

9. As the redneſs ſpreads with a pain like that from burning, it commonly diſappears, or at leaſt decreaſes in the parts it had before occupied.

10. All the parts upon which the redneſs appears are at the ſame time affected with ſome ſwelling, which continues for a time after the redneſs has abated.

11. The whole face becomes conſiderably turgid.

12. The inflammation coming upon the face does not produce any remiſſion of the fever which had before prevailed; and ſometimes the fever increaſes with the increaſing and ſpreading inflammation.

13. The inflammation uſually continues eight or ten days; and, for the ſame time, the fever and ſymptoms attending it alſo continue.

14. When the redneſs and ſwelling have proceeded for ſome time, there commonly ariſe, ſooner or later, bliſters of a larger or ſmaller ſize, on ſeveral parts of the face, containing a thin yellowiſh, or almoſt colourleſs liquor.

15. The ſurface of the ſkin, in the bliſtered places, ſometimes becomes *livid* and *blackiſh*; but this *livor* ſeldom goes deeper than the ſurface, or diſcovers any degree of gangrene affecting the ſkin.

16. On the parts of the ſurface not affected with bliſters, the cuticle ſuffers, towards the end of the diſeaſe, a conſiderable deſquamation.
17. The eye-lids are often ſo much ſwelled as entirely to ſhut up the eyes.

Eryſipelas ſometimes occaſions ſuppuration of the eye-lids, but with the inflammation the fever commonly ceaſes; and without evident criſis, the patient returns to his ordinary ſtate of health.

Perſons who have once laboured under this diſeaſe are very liable to have returns of it, eſpecially in ſpring and fall.

PRACTICAL OBSERVATIONS.

SECT. LVIII.

OTITIS*;

OR,

INFLAMMATION OF THE EAR.

This is marked by ſo excruciating a pain in the ear, as often to render the patient almoſt delirious. It often ends in ſuppuration, and produces incurable deafneſs.

SECT. LIX.

CORYZA†;

OR,

DEFLUXION OF THE NOSE.

This is rarely an idiopathic diſeaſe, but generally the firſt ſymptom of cold, or indication of an approaching aſthma, or meaſles; it is uſually accompanied with ſneezing.

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[*] From ȣς, the ear.

[†] From καρα, the head, and ζεω, to flow.

PRACTICAL OBSERVATIONS.

SECT. LX.

CYNANCHE TONSILLÁRIS*;

OR,

QUINSY.

THIS is an inflammation of the mucous membrane of the fauces, affecting eſpecially that congeries of mucous follicles which form the tonſils, and ſpreading from thence along the velum and uvula, ſo as frequently to affect every part of the mucous membrane.

The ſymptoms of this diſeaſe are,

1. Pain in ſwallowing.
2. Tumour ſometimes conſiderable, being at firſt one of the tonſils enlarged.
3. Inflammation ſurrounding the tonſil.
4. Deglutition difficult and accompanied with conſiderable pain.
5. Frequently this diſeaſe paſſes over to the other

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* From κυων, a dog, and αγχειν, to ſtrangle, and tonſillæ, the tonſils.

tonſil, and then deglutition is almoſt impoſſible, producing a ſenſe of almoſt immediate ſuffocation.

6. A troubleſome clammineſs of the mouth and throat.
7. A frequent but difficult excretion of mucus.
8. The neck is ſometimes puffed up, and this is reckoned not an unfavourable circumſtance, as it denotes leſs danger of ſuffocation.
9. There is often a pain of the internal ear, from the inflammation extending to the Euſtachian tube.
10. Pulſe often an hundred, full, ſtrong, and hard.

It is not unuſual in this diſeaſe to ſee patients able to ſwallow ſolids with leſs difficulty than liquids, becauſe the ſwallowing of liquids requires the action of more of the muſcular faſciculi ſubſervient to deglutition, than that of ſolids; the ſpittle, on account of its viſcidity, being more difficult to ſwallow than even the liquids uſed for drink, the patient ſuffers it to accumulate in the fauces, and hence the continual hawking, which increaſes the pain of the parts affected, and prevents ſleep.

The cynanche tonſillaris terminates by reſolution, that is diſperſion, or ſubſiding of the tumour and inflammation; or by ſuppuration.

PRACTICAL OBSERVATIONS.

SECT. LXI.

CYNANCHE TRACHEÁLIS*;
OR,
CROUP.

The ſeat of this diſeaſe is the membrane lining the upper part of the trachea.

The ſymptoms characteriſtic of it are the following:

1. A hoarſeneſs, with ſome ſhrillneſs and ringing ſound, both in ſpeaking and coughing, as if the noiſe came from a brazen tube.
2. Difficult reſpiration, ſhewn by a whizzing noiſe in inſpiration, as if the paſſage of the air was ſtraitened.
3. A dry cough.
4. Pulſe frequent and full.
5. An uneaſy ſenſation of heat.
6. Pain ſituated about the larynx.
7. Sometimes a redneſs and ſwelling about the fauces.

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* From τραχεια, the wind-pipe.

In this diſorder, ſo quick and fatal to children, the ſequel of the inflammation, if not reſolved, is an exudation analogous to that found on the ſurface of inflamed viſcera, appearing partly in a membranous cruſt, and partly in a fluid ſomewhat reſembling pus; hence,

8. If any thing is ſpit up, it is purulent matter, ſometimes containing films reſembling portions of a membrane; hence,
9. A ſenſe of ſuffocation, which actually happens from the obſtruction of the trachea, often extending along its ramifications, or bronchia.

In Dr. Hunter's Muſeum you may ſee a beautiful ſpecimen of this membrane.

PRACTICAL OBSERVATIONS.

SECT. LXII.

CARDÍTIS*;

OR,

INFLAMMATION OF THE HEART.

The membranes which line and divide the cheſt are extremely liable to become the ſeat of active inflammation, as well as the lungs. The heart alſo, and pericardium are alſo ſubject to the ſame inflammation (though the examples are rare), as may be diſcovered from the inſpection of dead bodies after death, wherein the heart has ſometimes been found in a ſtate of ſuppuration, and cruſted over with purulent matter. The characters of Carditis, however, are dubious and equivocal, reſembling thoſe of the other thoracic inflammations, whoſe general characters, however, are:

1. Fever, uſhered in with rigour.
2. Difficult breathing.
3. Head-ache.
4. Pain in the region of the heart.

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* From καρδια, the heart.

5. The pulſe, frequent, and irregular, hard, and quick.
6. Increaſe of ſymptoms, when lying on the left ſide.
7. Palpitation.
8. The greateſt anxiety and diſtreſs.
9. Syncope, or faintings.

PRACTICAL OBSERVATIONS.

SECT. LXIII.

PLEURÍTIS*;

OR,

PLEURISY.

The characters of this diſeaſe are,

1. Fever.
2. A hard tenſe pulſe, uſually full.
3. Acute pain, or ſtitch in the right ſide, ſeated under the ſixth or ſeventh rib, near the fleſhy part of the breaſt. This does not commence until ſome hours after the fever, and often is not felt until the third or fourth day.
4. A teaſing, dry cough, and
5. A ſtraitneſs, or oppreſſion, of the cheſt.
6. The blood cupped and covered with a buff coat.

But, as Cullen juſtly obſerves, this inflammation, local at firſt, commonly communicates to the contiguous parts, and extends not only over that part covering the ribs, but alſo over the mediaſtinum, and the whole ſurface of the lungs, for upon diſſection it has been ſhewn, in a hundred of inſtances, that the pleura, in its contracted ſenſe, is hardly ever affected alone, the inflammation being generally extended over the mediaſtinum and the whole membranous body of the lungs, in which caſe we have a peripneumony.

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* From πλευρα, the membrane inveſting the thorax:

PRACTICAL OBSERVATIONS.

SECT. LXIV.

PERIPNEUMÓNIA*;

OR,

INFLAMMATION OF THE LUNGS.

WE have before ſeen, that peripneumony is only a more general inflammation of the membrane which lines the cheſt, as well as the lungs, both external and internal, and it is contra-diſtinguiſhed by authors from pleuriſy by,

1. A moiſt cough, the matter ſpit up being frequently ſtreaked with blood.
2. The pain is ſituated ſometimes under the ſternum, ſometimes in the back, betwixt the ſhoulders; and when in the ſides, its place has been higher, or lower, more forward, or backward, than in the true pleuriſy.
3. The pain is generally dull and obtuſe, rather an expreſſion of diſeaſe, than an acute pain.
4. The breathing is much more laborious.

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[*] From *περι*, about, and *πνευμων*, the lungs.

5. Great pain upon inſpiration.
6. Pulſe leſs full and hard than in pleuriſy, often thready.

Sauvage has made two diſtinct genera of the pleuritis and peripneumonia, and has ſubdivided them into no leſs than thirty-two ſpecies; twenty of pleuriſy, and twelve of peripneumony. Though theſe minute diſtinctions are extremely ſatisfactory, conſidered as hiſtories of the diſeaſe, and the induſtry and accuracy of the obſerver are greatly to be admired, and commended, yet they are of no uſe taken on the great ſcale of things, and cannot aſſiſt the practitioner in his indications of cure. Perhaps it would have been better to have conſidered pleuriſy and peripneumony as one diſeaſe.

The pneumonic, like other inflammations, may terminate by reſolution, the excitability being worn down by the diſeaſe, when the cough gradually ceaſes, and the patient by degrees recovers his former health.

But in caſes where the patients have not been properly treated at firſt, the pneumonic, like other inflammations, may terminate in ſuppuration, ſometimes producing the depoſition of coagulable lymph on the ſurface of the pleura, which form numberleſs *adheſions*, joining the convex ſurface of the lungs to the ribs, or a *vomica* may be formed in the lungs, which very frequently is a conſiderable time before it burſts; and in ſome caſes where there happens to be but little preſſure on any of the larger trunks of the pulmonary veſſels, and the cyſt is of a compact texture, theſe abſceſſes will occaſion no great diſtreſs, nor much hectic fever; for, if there be little or no abſorption, we ſhall have little or no hectic fever; but whenever the vomica breaks, and the purulent matter is taken up by the abſorbents, and carried into the circulation, then the patient will be ſeized with alternate cold and hot fits, which will bring on profuſe ſweats, and in the end deſtroy life, unleſs it ſhould ſo happen, that the purulent matter ſhall be diſcharged by expectoration.

We may know that a vomica is formed, if after fourteen days the ſymptoms, though abated in violence, ſhall ſtill appear far from being removed; the cough, difficulty of breathing, and oppreſſion continuing, though the pain has ceaſed; the pulſe ſtill quick, though weaker and ſofter; and if, joined to theſe, the patient ſhall feel a ſlight ſhivering, and this be ſucceeded by heat, we may be certain that a ſuppuration has taken place: and when we find theſe ſymptoms grow every day more and more diſtreſſing, that the cough is exaſperated upon the leaſt motion, and the patient can only lie on the affected ſide, or perhaps cannot lie down at all, while weakneſs and waſting are daily more evident, then we may be aſſured that there is a formed collection of matter, from which the patient will have little or no proſpect of eſcaping, unleſs the abſceſs ſhould happen to burſt into the branches of the trachea, in ſuch a gradual manner as not to occaſion ſuffocation, but allow the purulent matter to be coughed up, and expectorated by degrees.

This diſeaſe, then, has alſo a termination peculiar to itſelf, which is a rupture of a veſſel, and ſuffuſion, which often brings on the fatal cataſtrophe, or is the foundation of a true phthiſis, or conſumption.

From the debility in the abſorbents, occaſioned by a long protracted pneumonia, the effuſed ſerum exhaled to lubricate every part is not taken up as quick as depoſited ; hence the frequent ſequel of pneumonia, hydrothorax, or water in the cheſt.

PRACTICAL OBSERVATIONS.

SECT. LXV.

CATARRHUS*;

OR,

CATARRH.

INFLAMMATION was before explained, when ſpeaking of the manner in which rheums in the head, creaks in the neck, inflammation of the eyes, colds, and rheumatic pains were produced, vide Vol. III. Sect. XI. to depend upon an increaſed irritability ariſing from an expoſure to partial cold, and ſubſequent ſtimuli.

We will here enter more particularly into the ſymptoms of catarrh.

1. It is not till the next day, or perhaps the ſecond or third day, that the perſon who has caught cold begins to complain and recollects his expoſure to cold, either partial (as is moſt common) or general.

This frequent, but curious fact, is ſimilar to what happens in the operations of the cauſes of other febrile diſeaſes. From the commencement of their action on the body, ſome time muſt elapſe before the ſyſtem in general can be affected by them, ſo as to produce the diſeaſe correſponding to the nature of the cauſe. The ſymptomatic fever, in conſequence of wounds, amputations, and other chirurgical operations on the body, is ſeldom conſiderable till the third day after they have been performed. So with bliſters it is ſome hours before the action commences. This cauſe will go on ſlowly, acting imperceptibly, until the ſyſtem in general is affected, exciting,

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* From *καταρειν*, to flow down.

2. More or leſs of fever, or that diſagreeable ſenſation over the body which generally precedes the acceſſion of fever.
3. The leaſt cold produces uneaſineſs even in warm weather.
4. The membranes of the noſe become firſt affected, and there is a dryneſs, and afterward defluxion of that part.
5. Often the amygdalæ, and other glands about the throat, mark the firſt ſtage of this diſorder.
6. There is frequently conſiderable hoarſeneſs, eſpecially towards night.
7. In a few days the trachea, or windpipe, becomes affected, when the throat appears huſky.
8. After which the natural ſecretion is increaſed, and altered, and there is a conſiderable diſcharge

charge of a thin ſharp rheum from the glands of the throat and fauces.

9. The ſecretion from the upper parts decreaſes, and it is now ſaid to fall upon the breaſt, which feels tight.

10. At firſt there is only a tickling uneaſy cough, expectoration comes on, which is thin at firſt, gradually becomes thicker,

11. And diminiſhes in quantity until the morbid ſecretion ceaſes with the recovery of the patient.

Unfortunately for the unthinking part of the human race, colds ſo often reſolve themſelves under every treatment, and being unaccompanied with ſickneſs or pain, are therefore fooliſhly neglected. It is only a cold, and hence little heeded. So the man goes to battle and eſcapes; but will the ſame good luck always await him? The pitcher that is often taken to the well comes home at laſt broken. Perſons who have colds on them are too often tempted, on account of buſineſs or pleaſure, to expoſe themſelves to viciſſitudes of cold and heat, by which means that preternatural irritability brought on the internal membrane of the bronchia is kept up, and the increaſed ſecretion and cough are often protracted for a conſiderable time. For, when the ſyſtem is once morbidly affected, or even after the patient has apparently recovered from his indiſpoſition, cauſes of the ſame kind, though greatly inferior to

what

what was at firſt neceſſary for the production of the diſeaſe, will exaſperate it, or ſubject the perſon to a relapſe often more ſevere than the firſt attack.

From theſe repeated attacks ſpitting of blood often ariſes, and very frequently obſtructions are formed, called tubercles.

It is highly probable, that a gradual reſolution of ſuch obſtructions takes place, eſpecially if the perſon eſcapes a return of the ſame diſorder for any conſiderable time. But if, from repeated colds, theſe obſtructions increaſe in number and obſtinacy, they become at laſt irreſolveable, and lay the foundation of what are called tubercles in the lungs, which are ſometimes attended with difficulty of breathing on any briſk or violent exerciſe, and are often the cauſe of a chronic dry cough. But, as theſe complaints are temporary, and not accompanied with pain, the danger of the diſorder is frequently overlooked, till, by ſome future catarrh, they are irritated into a ſtate of inflammation, and afterwards ſuppurating, bring on a phthiſis pulmonalis, the moſt treacherous and mortal of all diſeaſes.

Alſo every one who has been afflicted with a ſevere catarrh, ending in a troubleſome cough of long duration, becomes more liable to returns of it, on catching cold, than he was before the firſt attack of that diſorder. Such a perſon comes, by degrees, to have larger ſecretions of phlegm in his lungs than formerly, and, in conſequence of it, frequent fits of coughing, without any acceſſion of cold, eſpecially in the winter or cold weather, partly from a diminution of perſpiration, but chiefly from the general operation of cold on the body. This gradually increaſes as age advances, and often proves not only the cauſe of habitual coughs, but of the humoral aſthma.

PRACTICAL OBSERVATIONS.

SECT. LXVI.

FEBRIS CATARRHÁLIS;

OR,

A CATARRHAL FEVER.

THIS diſeaſe commonly comes on with the ſame ſymptoms as other febrile diſeaſes, that is,

1. With alternate chills and heats, often there is no pyrexia.
2. The cough comes on almoſt at firſt.
3. Accompanied with ſome expectoration, generally of a thick ropy mucus.
4. The face is ſwelled and fluſhed.
5. Some giddineſs and drowſineſs accompanies the diſeaſe.
6. There is a ſenſe of laſſitude over the whole body.
7. There is a difficulty of breathing.
8. A ſenſe of oppreſſion, and ſtraitneſs of the cheſt.
9. With ſome obſcure pain there.

10. The cough is frequent and violent.
11. Sometimes it excites even vomiting.
12. Frequently a rending head-ach accompanies this diſeaſe.
13. The blood drawn ſhews a buffy ſurface.

This diſeaſe has often the appearance only of a more violent catarrh, and after the employment of ſome remedies is entirely relieved by a free and copious expectoration. In other caſes, however, the feveriſh and catarrhal ſymptoms are at firſt very moderate, and even ſlight; but after a few days, theſe ſymptoms ſuddenly become conſiderable, and put an end to the patient's life when the indications of danger were before very little evident.

From the different circumſtances in which this diſeaſe appears, the pathology of it is difficult. It is certainly often no other at firſt than a *catarrhal affection*, which, in elderly perſons, is frequently attended with a large afflux of mucus to the lungs; and it was on this footing that Sydenham conſidered it as only differing in degree from his *Febris Hyemalis*. A catarrh, however, is ſtrictly an affection of the mucous membrane and follicles of the bronchiæ alone: but it may readily have, and frequently has, a degree of pneumonic inflammation joined to it; and in that caſe may prove more properly the peculiar diſeaſe we treat of here. But, further, as pneumonic inflammation very often produces an effuſion of ſerum into the bronchiæ, ſo this, in elderly perſons, may occur in conſequence of a

ſlight

ſlight degree of inflammation; and when it does happen, will give the exquiſite and fatal caſes of the peripneumonia notha, or baſtard pleuriſy, called ſuch when there is a ſuffuſion of ſputa, or lymph, thrown out into the cellular texture of the lungs.

PRACTICAL OBSERVATIONS.

SECT. LXVII.

CONTAGEOUS CATARRH;

OR,

INFLUÉNZA.

As contageous diſeaſes demand the popular attention, being ſuch as generally exclude the advice of phyſicians, who, provided they eſcape, are too much employed to attend every one who is ſeized, I ſhall be as explicit on this diſeaſe as poſſible.

Whilſt it was the general opinion of philoſophers, that all things upon earth were governed by the heavens, phyſicians imputed the epidemical catarrhous ſemipeſtilential fever to the influence of the ſtars; whence the Italians gave it the name of influenza. From Hippocrates to Sydenham, it was known and is mentioned by the name of febris *catarrhalis epidemica:* but Sydenham chiefly calls it *tuſſis epidemica.* Since Sydenham's time it has been variouſly named, but is now generally known by the name of *influenza.*

Dr.

Dr. Fothergill's account of this diſeaſe, as approaching more nearly to our own times, deſerves the higheſt attention.

About the beginning of the laſt month, the end of the year 1775, it was mentioned to me, ſays the benevolent Dr. Fothergill, that in many families moſt of the ſervants were ſick; that they had colds, coughs, ſore-throats, and other pulmonic complaints.

In the ſpace of a week theſe complaints became more general; few ſervants eſcaped them, eſpecially the men, who were moſt abroad; many of the other ſex, likewiſe, and people of higher conditions, were attacked: nor were children exempted.

The diſeaſe, which had hitherto been either left entirely to itſelf, or had been treated with the uſual domeſtic medicines appropriated to colds, now claimed the attention of the faculty, and, for the ſpace of near three weeks, kept them univerſally employed.

Moſt of thoſe whom I ſaw were ſeized (and often ſo ſuddenly as to be ſenſible of the attack)

1. With a ſwimming, or ſlight pain in the head.
2. A ſoreneſs of the throat.
3. Pains wandering over the body, with a ſenſe of coldneſs, particularly in the extremities.
4. A cough, ſoon followed by
5. A running of the noſe.
6. Watery eyes.
7. Slight nauſea.

8. More or leſs feveriſh heat.
9. Inquietude.
10. Pain about the breaſt.
11. The tongue was always moiſt.
12. The ſkin ſeldom hot and dry.
13. The pulſe often full, quick, and hard.

In a few days every complaint abated, except the cough, which continued after the ſubſiding of the other ſymptoms, which in the fore part of the night was exceedingly troubleſome and vexatious, and towards morning there generally came on a ſweat and eaſy perſpiration.

Many who neglected themſelves, and went abroad with the diſtemper upon them, frequently got additional colds, and brought on a fever of the moſt dangerous kind; a few died phrenetic.

Old aſthmatic perſons were likewiſe great ſufferers for the moſt part: a peripneumonic fever came gradually on, which often terminated fatally. And of thoſe who did recover, their amendment was ſlow, and treatment difficult.

And indeed it appeared that very few perſons wholly eſcaped the influence of this morbid conſtitution: for it ſeemed to aggravate every preſent malady.

It proved fatal likewiſe to ſeveral very young children, diſpoſing them to violent coughs or diarrhœas.

During this time, horſes and hogs were much affected; thoſe eſpecially that were well kept. The horſes had ſevere coughs, were hot, forbore eating, and were long in recovering. Not many of them died, that I heard of; but ſeveral dogs.

To the conſideration of the faculty in this city, is this ſketch of the late epidemic ſubmitted, with all due deference; and with a requeſt, that if the obſervations they have made do not correſpond with this recital, they will be pleaſed to communicate their remarks while the remembrance of the facts are recent; in order that as exact an account of this diſeaſe as poſſible may be tranſmitted to our ſucceſſors.

If thoſe phyſicians in the country, into whoſe hands this eſſay may come, will be ſo obliging as to mention the time when this epidemic made its appearance in their neighbourhood, and wherein it differed from the preceding ſketch, either in the ſymptoms or the method of cure, they will likewiſe contribute to the ſame good purpoſe. *The united obſervations of the faculty at large muſt greatly exceed the utmoſt efforts of any individual, however warmly he may be diſpoſed to promote the utility of his profeſſion.*

JOHN FOTHERGILL.

London, 6th Dec. 1775.

In conſequence of this circular letter Dr. Fothergill received the following anſwers. Firſt from

SIR JOHN PRINGLE, BART.

Preſident of the Royal College of Phyſicians.

1. THE ſpecies that I had of the influenza was a ſore throat, with fever and ſhooting pains through the back part of my head; but theſe ſymptoms were never followed by a cough. I heard of ſeveral others who, like me, had never been troubled with a cough, and only with this inflammatory angina.

2. I think you do well to record the ſtate of the weather; but I think the concluſion ought to be, that the ſenſible qualities of the air had moſt probably no ſhare in producing this epidemic, I ſhould be tempted to ſay, that they had evidently no part; for we hear of the ſame diſtemper having been in Italy, France, and in the Low Countries; and, I doubt not, in other parts of Europe, had we inquired. But it cannot be ſuppoſed that the ſtate of the atmoſphere, either as to weight, heat, or moiſture, was the ſame every where. And in the ſame country have we not ſeen it rage in one diſtrict, or city, whilſt others, at no great diſtance, were totally free? Yet between the ſound and the ſickly there could be no conſiderable meteorological difference. My concluſion, therefore, ſhould be, that ſuch epidemics (of which there have been four in my remembrance) do not depend on any principles we

are yet acquainted with, but upon ſome others, to be inveſtigated, and by ſuch means as Dr. Fothergill very properly and moſt commendably propoſes to be done by the united inquiries of his brethren.

DR. HEBERDEN.

December 16, 1775.

THE 28th of October was the firſt day on which the late epidemic cold ſeized upon any one whom I had an opportunity of obſerving; and at the end of three weeks the cauſe, whatever it was, of this diſtemper was ſo far weakened, as to be incapable of infecting thoſe who had eſcaped it until that time; though many, who had ſuffered by it before, continued to complain of the cough and hoarſeneſs much longer. The violence of this diſtemper uſually began to abate in five or ſix days.

In ſome it began with a ſickneſs and perpetual vomiting, which were the forerunners of a ſevere degree of this illneſs; in others the firſt ſymptoms were ſneezing, and a copious defluxion from the noſe and eyes, and theſe ſuffered much leſs, and were ſooner recovered. Many complained of a hoarſeneſs and ſore throat, and of a tightneſs, oppreſſion,

preſſion, and heat of their breaſts, and of feeling pains in various parts, particularly in their heads, ſides, and backs. Almoſt every one of theſe patients was afflicted with a racking cough; with a ſenſe of coldneſs frequently returning upon them; with a failure of appetite and of ſleep; and with a languor and weakneſs much greater than might have been expected from the effects of any of the other ſymptoms. The degree of fever was ſeldom great. I ſaw two perſons in this diſtemper who had eruptions upon their ſkins reſembling that of a ſcarlet fever. In two or three young men this diſorder was increaſed to a dangerous height, and became a true peripneumony, attended with bloody phlegm, and manifeſtly requiring frequent bleedings, by which they were much relieved. Towards the middle or end of this illneſs a few were attacked with intolerable ſtitches in their ſides or loins, ſo that for two or three days they were confined almoſt to the ſame poſture, and if they were neceſſitated to change it, they ſhewed all the marks of exquiſite pain. Lighter cramps in the legs and arms were not uncommon at the going off of this malady.

I knew none who could properly be ſaid to die of it; but it ſeemed to haſten the death of two or three perſons, whom I found dying of age, and of other diſeaſes.

The keeping quiet within doors, together with an abſtinence from the groſſer foods, and from heating liquors, was all which the generality of patients required. Small quantities of an opiate were very ſerviceable in allaying the inceſſant teaſing of the cough, and in quieting the reſtleſſneſs. Where the fever, or any of the ſymptoms, were conſiderable, it appeared to me that bleeding was unqueſtionably uſeful, and leſſened rather than increaſed the languor. In a few it was neceſſary, beſides bleeding, to employ bliſters, with the other uſual remedies for inflammations of the lungs.

SIR GEORGE BAKER, BART.

IT is certain that many people, both in this town and its neighbourhood, were attacked by the epidemic diſeaſe ſome days preceding the 20th of October. As to the preciſe day when I firſt heard of it, I cannot ſpeak of it with accuracy.

Men, confined by their buſineſs at home, ſuffered much leſs than thoſe who were expoſed to the air; and women, in general, leſs than men. Very young children were not much affected by this diſeaſe. Boys at ſchool were almoſt univerſally diſordered. Girls at ſchool (I ſuppoſe on account of their greater confinement) were remarkably free from the influence of this conſtitution; at leaſt, were not ſo generally attacked.

Many were ſuddenly ſeized with *great* giddineſs, and *intenſe* pain in the head; ſome with a conſiderable nauſea, which ſometimes continued ſeveral days. Some few had, in the beginning, ſucceſſive rigours. An uncommon languor, reſtleſſneſs, and anxiety, ſeemed to be the general characteriſtics of this diſeaſe.

I ſaw none whoſe firſt indiſpoſition was a *diarrhœa.* Thoſe who had a diarrhœa, had firſt complained of the common ſymptoms of a cold; which ceaſing, a diarrhœa followed. This, in ſome, aroſe even to a dyſentery. They had almoſt conſtant pains a little above the navel, and a very frequent evacuation of thin excrement, mixed with mucus. This was my caſe in particular, and that of ſeveral whom I viſited, and many others, a relation of whoſe caſes has been communicated to me.

Dr. Fothergill ſays, *the tongue was always white.* This ſeems too general an aſſertion: at leaſt the contrary happened in ſeveral inſtances which fell under my notice.

The blood, in the beginning, was not always *ſizy*; nor did I, in general, obſerve *the deep yellow ſerum* mentioned by Dr. Fothergill. Likewiſe *the cup-like appearance of the craſſamentum* was remarkable in ſeveral caſes.

In many caſes it was neceſſary to take away blood, even three or four times, on account of the violence of the pleuritic and peripneumonic ſymptoms.

Clyſters, frequently injected, were of ſingular ſervice.

The fever having ſenſibly remitted, according to my experience, the Peruvian bark was uſed with advantage. And likewiſe, when a languor and debility (as frequently happened) continued after the vehemence of the diſeaſe was ſubdued, this proved an uſeful remedy.

Many perſons, even now, feel the effects of this diſeaſe; and I know ſeveral who are likely to die tabid.

Accounts received from France, Holland, and Germany, give us reaſon to conclude, that this epidemic was much more fatal in other countries than in this iſland. And I believe it will appear that it was more fatal in ſeveral diſtant countries than in this metropolis and its neighbourhood.

January, 1776.

DR. HENRY REVELL REYNOLDS.

MY wife had this complaint on the 23d of October, and on the 2d of November I viſited ſeveral patients who had laboured under it for ſome days.

All my children had it. The order in which the ſymptoms appeared is as follows: watery eyes, ſwelling of the eye-lids, running from the noſe, cough, diarrhœa; ſo that every part of the mucous membrane ſeemed to be progreſſively attacked. I ſaw two others affected in the ſame way.

In two inſtances I ſaw the tongue very dry, parched, and chopped. The patients were both corpulent women, aged between 30 and 40. At the time I was called in to them they laboured under a true peripneumony; but I learned that they were firſt attacked with the catarrhal ſymptoms. Blood drawn from both theſe patients, even at the third bleeding, had a very thick buff coat, and exhibited the cup-like appearance.

Several whom I attended had this kind of diarrhœa; but I did not find it of ſervice to any: on the contrary, I thought it prejudicial to ſome, as it ſeemed to prevent a free expectoration, which, to my apprehenſion, was the moſt critical and moſt ſalutary evacuation. Neither did warm copious ſweats, though univerſal, (unleſs they happened before the ſeventh day) give that relief which one might have expected from them.

With reſpect to the method of cure, mine was nearly the ſame as yours, and in the ſame order. Permit me only to mention, that I found the Kermes mineral to anſwer my purpoſe exceedingly well, both as a diaphoretic and an expectorant. After ſeveral trials I preferred it to any other preparation of antimony.

In thoſe caſes where the diarrhœa was troubleſome I had recourſe to the ipecacuanha in ſmall doſes; a grain of the powder, for inſtance, once in ſix hours; and it ſucceeded to my utmoſt wiſh, checking the diarrhœa, and promoting a free expectoration.

January 29, 1776.

PRACTICAL OBSERVATIONS.

SECT. LXVIII.

PARAPHRENÍTIS;

OR,

INFLAMMATION OF THE DIAPHRAGM.

THIS diſeaſe, according to Dr. Cullen, is not to be diſtinguiſhed from Pneumonia, for when the membrane of the diaphragm is inflamed, it communicates the ſame affection to the other membranes, and is only a more complicated caſe of pneumonia. Dr. Cullen diſputes that it is accompanied,

1. With a raging delirium, like phrenitis.
2. Riſus ſardonicus, and
3. Other convulſive motions.

Dr. Cullen is therefore for dropping the diſtinction of this diſeaſe, as being a needleſs multiplication of terms, and would therefore wiſh to include carditis, pleuritis, peripneumony, and paraphrenitis, under one general term PNEUMONIA, or pneumonic inflammation.

PRACTICAL OBSERVATIONS.

SECT. LXIX.

GASTRÍTIS;

OR,

INFLAMMATION OF THE STOMACH.

The ſigns of gaſtritis are,

1. Moſt acute pain in the ſtomach, always increaſed upon ſwallowing even the mildeſt kind of drink.
2. Inexpreſſible anxiety.
3. Great internal heat, ſomething like heartburn, extending along the œſophagus.
4. Conſtant retching.
5. Frequent hiccup.
6. The pulſe ſmall, quick, and intermitting.
7. The debility extreme.

When a real inflammation once takes place in ſuch a ſenſible part as the ſtomach, there muſt be very little chance for the patient's eſcape; for, unleſs the inflammation can be reſolved in the very beginning, it almoſt conſtantly ends in a mortification, there being ſcarcely any room for ſuppuration, the part affected not having enough of the looſe cellular texture, to admit that way of termination.

PRACTICAL

PRACTICAL OBSERVATIONS.

SECT. LXX.

SPLENÍTIS*;

OR,

INFLAMMATION OF THE SPLEEN.

THE ſigns are,

1. A fixed, dull pain.
2. A ſoreneſs felt upon preſſing the ribs moſt contiguous to the ſpleen.
3. An obſcure remitting fever.

As an original diſeaſe, the ſplenitis is exceedingly rare; but the ſpleen is frequently loaded in conſequence of certain fevers, particularly the remittent, and often remains for a great length of time in the ſcirrhous or indolent ſtate. Sometimes a ſuppuration takes place in this viſcus, and that without much previous diſtreſs, or evident diſorder, until, burſting all at once, the purulent matter is let looſe among the abdominal viſcera, and in a few days puts an end to the patient's life.

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* From σπλην, the ſpleen.

PRACTICAL OBSERVATIONS.

SECT. LXXI.

HEPATÍTIS*;

OR,

INFLAMMATION OF THE LIVER.

WE now quit thoracic complaints, and proceed in order to inflammation of the parts contained within the abdomen, ſituate below the diaphragm.

The firſt we ſhall give a deſcription of is the hepatitis.

The acute hepatitis is a very uncommon caſe in this climate, and may be diſtinguiſhed by the following characters.

1. There is an acute pain at the top of the ſhoulder near the clavicle.
2. A dull obtuſe pain juſt under the ſhort ribs on the right ſide, extending to the back, and round to the ſhoulder.
3. The countenance appears ſallow.
4. The pulſe is quick and thready.
5. The patient cannot lie on the left ſide.

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* From ηπαρ, the liver.

6. Preſſing under the ſhort ribs gives pain.
7. The breathing is painful and difficult.
8. There is a dry cough.
9. Sometimes great ſickneſs and vomiting, and hiccup.

If the inflammation is not reſolved, there is induced often a ſcirrhous ſtate of this viſcus, generally ending in dropſy, or an abſceſs is formed, which either burſts into the cavity of the abdomen at large, in which caſe death muſt inevitably enſue, as the ſharp purulent matter will corrode the ſurfaces of the other viſcera; or it puſhes outwardly, and occaſions a ſwelling which ſometimes points ſo as to be favourable for opening.

If it ſhould happen that the liver, where it was inflamed, adheres all round to the peritonæum, ſo as to form a bag for the matter, and hinder it from falling into the cavity of the abdomen, then opening the abſceſs by a ſufficiently large inciſion will probably ſave the patient's life; but if the adheſion to the peritonæum be imperfect, the matter will fall down between it and the liver into the cavity at large, and the caſe will be as deſperate as that which has been juſt now mentioned.

Sometimes the matter of an hepatic abſceſs comes away in the urine, and ſometimes it is diſcharged by ſtool. When the matter comes off in the urine, we may conclude that it has been taken up by the branches of the vena cava, which are diſtributed through the liver, and thus carried back into the circulation, from whence it is ſeparated by the kidneys. But when the pus comes off by ſtool, it muſt either have burſt into the biliary ducts, and ſo have been carried by the ductus communis into the duodenum; or the abſceſs having been formed in the concave part of the liver, where it lies contiguous to the colon, muſt have adhered to this inteſtine, and burſt into its cavity, from whence the matter will be diſcharged by ſtool, in a ſudden and large flow, to the great and immediate relief of the patient.

PRACTICAL OBSERVATIONS.

SECT. LXXII.

EPIPLOÍTIS*;

OR,

INFLAMMATION OF THE OMENTUM.

THIS is a very uncommon diſeaſe, and may be known,

1. By a ſharp pain in the upper and forepart of the abdomen.
2. Tenſion and ſoreneſs upon preſſure.
3. The uſual ſigns of pyrexia, or inflammatory fever.

This inflammation, like the others, reſolves itſelf or terminates in ſuppuration, when the matter burſting into the cavity of the abdomen, leaves the patient without hopes of recovery.

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[*] From επιπλοον, the omentum.

PRACTICAL OBSERVATIONS.

SECT. LXXIII.

PERITONÍTIS*;

OR,

INFLAMMATION OF THE PERITONEUM.

The ſymptoms of this rare diſeaſe, perhaps only exiſting after delivery, are,

1. The extreme ſoreneſs felt all over the abdomen, it not bearing the leaſt preſſure.
2. General pyrexia.

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* From *παριτοναιον*, the peritoneum.

PRACTICAL OBSERVATIONS.

SECT. LXXIV.

ENTERÍTIS[*].

The ſigns of enteritis are,

1. A tenſion of the belly.
2. Great internal pain.
3. So great external ſoreneſs about the navel, as ſcarcely to bear the ſlighteſt touch.
4. Pyrexia.
5. The greateſt debility.
6. A quick and thready pulſe.

If the inflammation is not ſoon reſolved, the enteritis terminates in gangrene in the courſe frequently of a few hours. People who die of a mortification in the inteſtines, feel no diſtreſs for ten or twelve hours before death, as the pain ceaſes entirely by that time, and they ſink away, perfectly in their ſenſes to the laſt minute: the ſinking of the pulſe, the pale ghaſtly look, and the cold clammy ſweats, all teach us to foretel the fatal event, which the patients themſelves are ſeldom aware of, but, from the ceaſing of the pain, are apt to conclude themſelves in a way of recovery.

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[*] From εντερα, the bowels.

PRACTICAL OBSERVATIONS.

SECT. LXXV.

NEPHRÍTIS*;

OR,

INFLAMMATION OF THE KIDNEYS.

THE ſigns are,

1. Acute pain and heat in the ſmall of the back.
2. Urine of a deep red colour and ſmall in quantity, or colourleſs.
3. Retching to vomit.
4. Retraction of one of the teſtes not unfrequent.
5. A great numbneſs along the thigh.
6. The common ſymptoms of pyrexia.

It is diſtinguiſhed from the lumbago by the vomiting, retraction of the teſtes, numbneſs, and by the patient being able to raiſe himſelf up without exciting ſevere pain.

A ſuppuration is often formed in the kidneys;

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[*] From *νεϱος*, a kidney.

and we may conclude that it is ſo, when, notwithſtanding the abatement of the pain, we ſtill find the patient complain of a ſenſe of weight in the lumbar region, while at the ſame time there are frequent ſhiverings, ſucceeded by hot fits, and the urine, from being red and without ſediment, comes to be whitiſh and turbid. As the purulent matter in theſe caſes is ſpeedily waſhed off, and carried away by the urine, it is not ſo liable to be abſorbed, and hence it is, that people have been known to labour for many years under an ulcer of the kidneys, without being much affected by the hectic fever.

PRACTICAL OBSERVATIONS.

SECT. LXXVI.

CYSTÍTIS*;

OR,

INFLAMMATION OF THE BLADDER.

THIS diſeaſe is diſcriminated,

1. By a difficulty and total ſtoppage in making water.
2. Teneſmus.
3. Pyrexia.

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[*] From κυστις, the bladder.

PRACTICAL OBSERVATIONS.

SECT. LXXVII.

HYSTERÍTIS*;

OR,

INFLAMMATION IN THE WOMB.

1. VIOLENT pain in that part.
2. Pyrexia.
3. Convulſion, or epilepſy.

This diſeaſe ends in ſuppuration, or a diſeaſed ſecretion, commonly called a cancer of the womb.

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* From ὑστέρα, the womb.

PRACTICAL OBSERVATIONS.

SECT. LXXVIII.

ARTHOPYÓSIS*;

OR,

WHITE SWELLING.

We now proceed to conſider diſorders of the extremities. Arthopyoſis is ſhewn by,

1. A fixed dull pain, laſting for many months, in ſome joints.
2. There is uſually ſome ſwelling, but without marks of inflammation of the joint.
3. No pyrexia.

This diſorder uſually terminates in a real white ſwelling, or enlargement of the bone.

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* From αρθρον, a joint, and πυον, matter.

PRACTICAL OBSERVATIONS.

SECT. LXXIX.

PARONYCHIA;

OR,

WHITLOW.

1. Acute pain and ſwelling at the extremity of the thumb, or finger.
2. Slight, or no pyrexia.

Phlegmons, or boils, are circumſcribed inflammation of the ſame kind, but affecting different parts of the body. Theſe two laſt are properly the province of the ſurgeon.

THERAPEUTICKS.

INTRODUCTION.

SECT. LXXX.

GENERAL INDICATIONS OF CURE IN STHENIC DISEASES.

As the morbific diſpoſitions and remote cauſes are what we ought to have in view when we endeavour to prevent diſeaſes, ſo the actual or immediate cauſes are the things which we muſt conſider when we alleviate or cure them. The *Therapeia* therefore is to be chiefly directed, ſo as to obviate and remove the actual cauſes, whether the diſeaſe be univerſal, conſiſting of the general ſymptoms; or local, depending on the diſorder of ſome particular part of the corporeal frame.

The general indications of cure in ſthenic diſeaſes are,

I. THE ABSTRACTION OF STIMULI.

II. THE AVOIDING OF STIMULI BOTH DIRECT AND INDIRECT.

III. SEDATIVE POISONS.

THE ABSTRACTION OF STIMULI.

PRACTICAL OBSERVATIONS.

SECT. LXXXI.

OF BLEEDING.

This has been long conſidered as the greateſt agent in medicine: for it completely carries off a ſtimulus, ſo much the more powerful than any other, as it pervades the whole frame. And if phyſicians have not preciſely known, whereby the living, or moving principle, was produced, yet could they not fail to obſerve, that the ſtrength of the muſcular fibres was in proportion to the quantity of blood in the frame. Hence, when the muſcular force of the whole frame is weakened, the heart, as a particular muſcle, will want ſomewhat of its power to propel the blood; hence the circulation becomes more languid, and the balance betwixt the irritable principle and ſtimuli gets reſtored.

Where there is an indication for bleeding, that is violent action, with a ſtrong conſtitution, bleeding freely will be of ſingular ſervice. As it ſeldom happens that bleeding once will be ſufficient in a conſiderable inflammation, the firſt, or preceding blood taken, becomes a ſymptom of the diſeaſe.

If the coagulating lymph is ſuperabundant *, there will be what is called a thick buff; and if its ſurface is conſiderably cupped, then future bleedings may be uſed with leſs caution; becauſe ſuch appearance indicates ſtrong powers of coagulation, which always ſhews ſtrength in the ſolids; but if the blood is weak in its powers of coagulation, lies flat in the diſh, then we muſt be cautious in our future bleedings; or if it was ſtrong at firſt in its powers of coagulation, and after repeated bleedings becomes weak, then we muſt not purſue this further; but in ſome caſes it is proper to purſue it to this point, for we ſhall ſometimes find that the inflammatory ſymptoms ſhall not ceaſe after repeated bleedings, if the ſtrength continues; but the moment a degree of looſeneſs is produced in the blood, that moment will the inflammatory action ceaſe.

The following caſe is a ſtrong inſtance of this. A lady had a violent cough, tightneſs in reſpiration, ſtrong ſizy blood, and the ſymptoms continued to the ſixth bleeding, when the blood was not quite ſo

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* The ſuperabundance ſeems to be for the formation of new parts; a wiſe intention of nature, who has often wounds of the external ſurface to make up and repair: but this becomes a ſource of evil in viſceral complaints, being the material for the formation of adheſions.

ſizy: but the moſt remarkable change was, its remaining flat on the ſurface. Upon this bleeding, all the ſymptoms diſappeared; and here, although the blood became weak in its power of coagulation, yet it did not produce weakneſs in the conſtitution, the veſſels of the inflamed parts having ſtill had power to contract.

On the other hand, there may be indications for bleeding ſparingly: firſt, when there is too much action, with weakened powers: ſecondly, when there is a diſpoſition to form but little blood: thirdly, when the part affected is far from the ſource of the circulation.

From the above three diſpoſitions that require bleeding ſparingly, or with caution, I may obſerve, that it will moſt probably be proper in all ſuch caſes to bleed from, or as near the part affected as poſſible, in order to have the greateſt effect, with the loſs of the leaſt quantity of blood; more ſo than when the conſtitution is ſtrong; becauſe the conſtitution in ſuch caſes ſhould feel the loſs of blood as little as poſſible; if from the part, leeches will anſwer beſt, becauſe commonly little irritation follows the wound of a leech: however, this can only be put in practice in inflammations not very remote from the ſurface. But in many caſes the blood cannot be taken away from the part itſelf, but only from ſome neighbouring part, ſo as to affect the part inflamed: thus, we bleed in the temporal artery for inflammation of the eyes; we bleed in the jugular veins for inflammation of the brain; and alſo in the temporal artery, to leſſen the column of blood going to the brain, by the internal carotids.

Hippocrates adviſes taking blood from the right arm in pleuriſies, and there appears ſome reaſon in this, for the pain is generally ſeated in the right ſide, the aorta taking a curve in that direction, and hence the blood is more determined to that ſide, which occaſions all nations to be right-handed.

But the doctrine of revulſion taking place, the practice was to perform blood letting in pleuriſies on the oppoſite ſide.

This produced the moſt violent contention among the faculty; and Briſſot, who was the ſupporter of Hippocrates and Galen, diſcouraged, probably, by the contradictions which he muſt have ſuffered at Paris in combating the opinions that were adopted by his maſters, conceived a great inclination to travel, even to the new world; he ſtopped in Portugal, where he did not fail to propoſe his doctrine.

Denis, phyſician to the king of Portugal, and whom we ſhould rank in the number of thoſe men who have made themſelves known to the world only by unhappy criticiſms; this man who was willing to ſet himſelf up as ſovereign maſter of the art, maintained, againſt Briſſot, the doctrine of the Arabians; he appealed to the academy of Salamanca, who decided in favour of Briſſot.

The partiſans of the latter, who died during the diſpute, multiplying prodigiouſly, Denis raiſed againſt them every kind of battery; they were publicly taxed with ignorance and temerity; they were repreſented as innovators and diſturbers of the public repoſe: the diſpute was carried to the tribunal of the emperor, who did not declare himſelf on either ſide in this affair; in the mean time there appeared books in all parts of Europe in behalf of Briſſot, whoſe ſectators remained conquerors for ſome time.

"Who can help admiring," ſays Bayle, "on one ſide, the obſtinacy that is remarkable in mankind in favour of popular tradition, how ill grounded ſoever it may be; and on the other, the readineſs which the public ſhews in declaring for or againſt certain remedies; it is generally carried away by the party that cries loudeſt *."

Too much action, with ſmall powers may often, if not always, be claſſed with the *irritable conſtitution*, and bleeding ſhould then be performed with very great caution: one caſe out of many I ſhall relate as an inſtance of great action with debility.

A gentleman had one of the moſt violent inflammations I ever ſaw, in one of his eyes, attended with violent pain in his head, the blood extremely ſizy, all of which denotes great action of parts; yet the buff of the blood was ſo looſe when coagulated, that it could hardly bear its own weight, or make any reſiſtance to the finger when preſſed; and although he was bled pretty freely, yet he never found any relief from it. This blood becoming a ſymptom, both of the conſtitution and diſeaſe, manifeſtly ſhowed weak powers from its looſeneſs, and too great action from its ſlowleſs of coagulation, which was the cauſe of the buff.

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* Diction. art. Briſſot.

The following caſe is another ſtrong inſtance of great action in a weak, irritable habit. A lady had a violent inflammation of the leg, ſo as to form a conſiderable ſuppuration; with a pulſe of one hundred and twenty, one hundred and twenty-five, and often one hundred and thirty, in a minute: her blood was extremely ſizy, yet ſhe received but little benefit from the firſt bleeding, although the blood coagulated pretty firmly, which indicated ſtrength. She was of an irritable conſtitution, ſo as to receive leſs benefit from bleeding than another; and when bled three times, the blood became extremely looſe in its texture, which bark removed, as well as the other ſymptoms. Upon leaving off the bark, the ſymptoms all recurred, and when ſhe was bled again for the ſecond attack, which was the fourth time, the blood, although inflammatory, had recovered a good deal of its proper firmneſs; but in the ſecond bleeding, for this ſecond attack, it was leſs ſo; and in the third it was ſtill leſs. Suſpecting that bleeding in the preſent caſe would not produce reſolution I paid particular attention to the pulſe at the time of bleeding, and found that in this laſt bleeding the pulſe increaſed in its frequency even in the time of bleeding; and within a few minutes after the bleeding was over, it had increaſed ten ſtrokes in the minute*. Theſe bleedings retarded ſuppuration, but by producing irritability they could not effect reſolution.

Where there is a diſpoſition to form but little blood, when known, bleeding ſhould be performed with great caution.

When the inflammation is far from the ſource of the circulation, the ſame precautions are neceſſary. In general it can be taken away from the part in ſuch caſes. But theſe are only ſo many facts, that require peculiar ſymptoms to aſcertain them.

The common indications of bleeding, beſides inflammation, are too often very little to be relied upon. The pulſe is the great indication in inflammation; but not always to be depended upon. In inflammations that are viſible, a knowledge of the kind of inflammation is in ſome degree aſcertained, as has been obſerved, we therefore go upon ſurer ground in our indications for bleeding: but all inflammations are not viſible; and it is, therefore, neceſſary to have ſome other criterion: however, if we could aſcertain the pulſe, peculiar to ſuch and ſuch appearances, in viſible inflammation, and that was univerſally the ſame in all ſuch appearances, we might then ſuppoſe that we had got a true indicative criterion for our guide, and therefore apply it to inviſible inflammation, ſo as to judge of the inflammation by the ſtate of the pulſe; but when we conſider, that the ſame kind of inflammation in every part of the body will not produce the ſame kind of pulſe, but very different kinds, not according to the inflammation, but according to the nature of the parts inflamed, and thoſe other parts alſo not viſible, we loſe at once the criterion of pulſe as a guide. When we conſider, alſo, that there ſhall be every other ſign, or ſymptom, of inflammation in ſome viſcus, and from the ſymptoms the viſcus ſhall be well aſcertained, yet the pulſe ſhall be ſoft, and of the common frequency; and upon bleeding, in conſequence of theſe inflammatory ſymptoms, the blood ſhall correſpond exactly with all of them, except the pulſe; it ſhall be ſizy, firm, and cup, as was the caſe in a lady, which has been before deſcribed, we ſhall be ſtill farther convinced that the pulſe is a very inadequate criterion.

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* This fact, of the pulſe increaſing upon bleeding, is not always to be ſet down as a ſure ſign of irritation being an effect; for in a ſluggiſh pulſe, ariſing from too much blood, the increaſe of ſtroke, and freedom given to the circulation is ſalutary; but when a pulſe is already quick, an increaſe muſt ariſe from irritation.

If a pulſe be hard, pretty full, and quick, bleeding appears to be the immediate remedy, for hardneſs rather ſhews ſtrong contractile action of the veſſels not in a ſtate of inflammation, which alſo implies ſtrong action of the blood: and from ſuch a pulſe, a ſizy blood will generally be found; but even a quick, hard pulſe, and ſizy blood, are not always to be depended upon as ſure indications of bleeding being the proper method of the reſolution of inflammations; more muſt be taken into the account.

The kind of blood is of great conſequence to be known; for although it ſhould prove ſizy, yet if it lies ſquat in the baſon, and is not firm in texture, and if the ſymptoms, at the ſame time, are very violent, bleeding muſt be performed very ſparingly, if at all; for I ſuſpect that under ſuch a ſtate of blood, if the ſymptoms continue, bleeding is not the proper mode of treatment. The caſes of this kind, which have been related, are ſtrong proofs of this.

As the pulſe, abſtracted from all other conſiderations, is not an abſolute criterion to go by, and as ſizy blood, and a ſtrong coagulum are after proofs, let us ſee if there be any collateral circumſtances that can throw ſome light on this ſubject, ſo as to allow us to judge, à priori, whether it be right to bleed or not, where the pulſe does not of itſelf indicate it. Let us remember, that in treating of inflammation of different parts, we ſhould take notice of the pulſe peculiar to each part, which I may now be allowed to repeat.

Firſt, I obſerved that an inflammation in parts not vital, or ſuch as the ſtomach did not ſympathize with, if there were great powers, and the conſtitution not very irritable, the pulſe was full, frequent, and hard.

Secondly, that on the contrary, in inflammations of the ſame parts, if the conſtitution was weak, irritable, &c. that then the pulſe was ſmall, frequent, and hard, although perhaps not ſo much ſo as when in vital parts.

Thirdly, that when the inflammation is in a vital part, ſuch as the ſtomach, inteſtines, or ſuch as the ſtomach readily ſympathizes with, then the pulſe is quick, ſmall, and hard, ſimilar to the above.

Now, in the firſt ſtated poſitions we have ſome guide, for in the firſt of theſe, viz. where the pulſe is ſtrong, &c. there bleeding is moſt probably abſolutely neceſſary, and the ſymptoms, with the ſtate of blood joined, will determine better the future conduct; but in the ſecond, where the pulſe is ſmall, very frequent, and hard, bleeding ſhould be performed with great caution; yet in inflammations of the ſecond ſtated parts, the conſtitution ſeems to be more irritable, giving more the ſigns of weakneſs, as if leſs in the power of the conſtitution to manage.

Bleeding, reſtricted to two or three ounces, can do no harm, by way of trial; and, as in the firſt caſe, the ſymptoms and blood are to determine the future repetition; but in the third, or vital parts, viz. either the ſtomach, or ſuch as the ſtomach ſympathizes with, we are yet, I am afraid, left in the dark reſpecting the pulſe. Perhaps, bleeding at firſt with caution, and judging from the blood and its effects upon the other ſymptoms, is the only criterion we can go by.

The kind of conſtitution will make a material difference, whether robuſt, or delicate.

The mode of life will alſo make a material difference, whether accuſtomed to conſiderable exerciſe, and can bear it with eaſe: conſtitutions ſo habituated will bear bleeding freely, but thoſe with contrary habits will not.

The ſex will likewiſe make a difference, although the mode of life will increaſe that difference; therefore men will bear bleeding better than women: even age makes a material difference, the young being able to loſe more blood than the old; for the veſſels of the old are not able to adapt themſelves ſo readily to the decreaſed quantity; it even ſhould not be taken away ſo quickly; and probably the conſtitution may, in ſome degree, have loſt the habit of making much blood, ſince it has loſt the neceſſity.

The urine will throw ſome light on the diſeaſe; if high coloured, and not much in quantity, it may be preſumed, with the other ſymptoms, that bleeding will be of ſingular ſervice; but if pale, and a good deal

of

of it, although the other indications are in favour of bleeding, yet it may be neceſſary to do it with caution.

However, bleeding ſhould in all caſes be performed with great caution, more particularly at firſt; and no more taken then appears to be really neceſſary; it ſhould only be done to eaſe the conſtitution, or the part, and rather lower it where the conſtitution can bear it: but if the conſtitution is already below or brought below a certain point, or gives the ſigns of it from the ſituation of the diſeaſe, then an irritable habit takes place, which is an increaſed diſpoſition to act without the power to act with. This, of itſelf, becomes a cauſe of the continuance of the original diſpoſition, and therefore will admit neither of reſolution, nor ſuppuration, but continue in a ſtate of inflammation; which is a much worſe diſeaſe than the former.

By bleeding the attractive power of the muſcular fibre for oxygen is diminiſhed. Upon any other principle than this above mentioned, I cannot ſee why bleeding ſhould have ſuch effects in inflammation as it ſometimes has. If conſidered in a mechanical light, as ſimply leſſening the quantity of blood, it cannot account for it; becauſe the removal of any natural mechanical power, can never remove a cauſe which neither took its riſe from, nor is ſupported by it: however, in this light it may be of ſome ſervice; becauſe, all the actions relative to the blood's motion will be performed with more eaſe to the ſolids, when the quantity is well proportioned.

It is probably from that connexion between the ſolids and fluids, that the conſtitution, or a part, is in a ſtate of perfect quietude, or health, in which we find that the fluids are, and ought to be, in a large quantity; but in a ſtate of inflammation, or increaſed powers and actions, thoſe proportions do not correſpond, at leaſt in the parts inflamed; and by producing the equilibrium between the two, ſuitable to ſuch a ſtate, the body becomes ſo far as this one circumſtance can affect it, in a ſtate of health; and this in many caſes will caſt the balance in favour of health: it is not, however, ſufficient to produce this effect in all inflammations.

The modes of direction are,

Mittatur ſang. ad unc. —

Let —— ounces of blood be taken, mentioning the quantity; or

Hirudines temp. vel part. dolent. applic.

Let —— leaches be applied to the temples, or to the part affected, mentioning the number.

Imponant. cucurbitulæ inter ſcapul. ſang. et mit. ſanguis ad unc. —

Let cupping glaſſes be applied betwixt the ſhoulders, and ſo many ounces of blood be taken, mentioning the quantity.

PRACTICAL OBSERVATIONS.

SECT. LXXXII.

VOMITING.

When a moderate doſe of an emetic is ſwallowed, after the diſguſt proceeding from the taſte is paſt, the ſtomach remains for ſome time undiſturbed: but within twenty minutes, a half, or a whole hour, an uneaſy ſenſation and nauſea commence. Theſe ſenſations come and go, the ſickneſs on the whole increaſing. There is likewiſe often pain felt in the head, ſlight rigours take place in various parts of the body, the pulſe becomes weak and irregular, but generally ſlow; the face and lips grow pale; the eyes loſe their luſtre, and the countenance appears dejected. After theſe ſymptoms have continued for ſome time, the nauſea increaſes to the utmoſt height, and vomiting begins.

During the action of vomiting, the body is very violently agitated; the ſtraining is attended with a great deal of pain both in the ſtomach and head; the face and eyes become red, all the veins appearing turgid with blood; a ſweat breaks out upon the face and other parts of the body, and the pulſe is quick and ſtrong.

The vomiting uſually intermits after two or three fits of retching, and all the violent ſymptoms go off; leaving the patient in a languid ſtate, and oppreſſed with ſickneſs. After ſhort intervals there are uſually two, three, or more attacks of retching, with the ſame ſymptoms as the firſt. At laſt the vomiting entirely ceaſes, though the nauſea continues ſome time longer, the pulſe being weak and ſlow, and the patient feeling himſelf almoſt exhauſted, and drowſy.

Such are the uſual ſymptoms which follow the operation of emetics in general; but there are others attendant on particular emetic ſubſtances. When the retching ceaſes, for example, after an antimonial vomit, the pulſe becomes ſtrong and frequent, the ſkin hot, an univerſal perſpiration generally breaks out, and ſometimes a purging occurs. When the ſquill emetic is taken, inſtead of theſe effects, a conſiderable increaſe of the ſecretion of urine uſually follows: but whichever kind of emetic has been given, after all the evacuations have ceaſed, the patient feels conſiderably debilitated, and his pulſe is a good deal lowered.

There is another effect from emetics, which deſerves to be noticed, that the evacuation goes further; and the duodenum, with a portion of the jejunum, may be, and commonly is, evacuated at the ſame time. The periſtaltic motion of the alimentary canal may proceed downwards or upwards; and when any portion of its acting is, by any circumſtance, directed in one way, the next adjoining portion follows the ſame direction. From this, in vomiting, as the periſtaltic motion of the ſtomach is directed upwards, ſo the motion of the duodendum is directed in the ſame manner, and pours its contents into the ſtomach; from which it will appear, that in vomiting, a conſiderable portion of the upper part of the inteſtines may be evacuated, as we have alleged.

The moſt clear proof of the inverted motion of the duodenum is, that in vomiting, and eſpecially after repeated vomiting, a quantity of bile ſeems to be poured from the duodenum into the ſtomach, and is in conſequence thrown out by the mouth. This frequent appearance may depend entirely upon the quantity of bile for the time preſent in the duodenum, but it probably extends farther. When, in conſequence of digeſtion, alimentary matters paſs into the duodenum, as it may be ſuppoſed that Nature intends the gall-bladder and biliary ducts ſhould then pour their fluids more copiouſly into the duodenum; ſo it may be ſuppoſed, on this occaſion, that bile is poured more copiouſly into the duodenum, and, in conſequence of the inverted motion, more copiouſly into the ſtomach, from whence it may appear more copiouſly in what is thrown up by vomiting. If this ſhould not be thought ſufficient to account for a quantity of bile being frequently thrown up by vomiting, there is another cauſe, perhaps one more powerful, to be alleged. In the action of vomiting, as the contraction of the diaphragm and of the abdominal muſcles concurs at the ſame time, the whole viſcera of the abdomen are ſtrongly preſſed: this preſſure muſt affect the gall-bladder and biliary ducts, and occaſion them to pour out their contents very largely; and thereby eſpecially a large portion of bile may be thrown up by vomiting.

On this ſubject I muſt remark, that both the vulgar, and even ſome phyſicians, have been ready to ſuppoſe, that the bile thrown up by vomiting exiſted previouſly in the ſtomach itſelf, and in ſome inſtances it may have been ſo; but it is more probable that it has been brought from the duodenum, and even from the gall-bladder and biliary ducts, in the manner we have explained. There is this particular reaſon for ſuppoſing it, that if the bile had been previouſly lodged in the ſtomach itſelf, it might have appeared in the firſt vomitings as well as in the laſt: but it happens in moſt inſtances that the bile is thrown out by the mouth only after repeated vomitings, and often after repeated ſtrainings in the organs employed in vomiting.

It was obſerved that emetics ſeldom excite any ſenſation in the ſtomach for ſome ſhort period after they are ſwallowed. This is perhaps owing to the mucus on the internal ſurface of the ſtomach preventing the emetic from immediately coming into contact with the nerves. Nauſea or ſickneſs is a ſenſation peculiar to the ſtomach, of an uneaſy nature; but ſo different from pain, that it ſeems in ſome degree another ſenſe. The ſtomach is ſuſceptible of pain, however, when injured or inflamed. But nauſea is produced by a ſet of ſubſtances which have no power to injure the ſtomach either mechanically or chemically. It is an impreſſion felt by the nerves of the ſtomach, as flavours and taſtes are perceived by the noſe and tongue. As the ſtomach is ſuſceptible of thoſe two ſenſations ſo different from each other, it would be curious to inquire whether both are conveyed by the ſame ſet of nerves. The ſtomach receives nerves both from the *par vagum* and *intercoſtals*. It ſeems not impoſſible that the ſenſation of nauſea is conveyed only by the branches of the *par vagum* which ariſe immediately from the brain; and that the more common ſenſations proceed from the *intercoſtals*. But, however this may be, a conſiderable number of ſubſtances produce nauſea, and an inclination to vomit.

It is not to be expected that any explanation can be given of a ſenſation. There muſt be, however, ſome reaſon why our ſtomachs are made ſuſceptible of this ſenſation; and all emetics muſt poſſeſs ſome common quality by which they excite it.

It can hardly be doubted but that the ſenſation of nauſea and power of vomiting are given to the ſtomach for the beneficial purpoſe of throwing out ſuch ſubſtances as would prove detrimental to the body if they remained in it. It is therefore extremely probable that all emetics poſſeſs ſome noxious quality; which idea is corroborated by this—that if any emetic ſubſtance is given in repeated doſes, each ſo ſmall as not to excite vomiting, they uſually occaſion a purging; and if the medicine gets into the blood, either by the purging not taking place of itſelf, or by its being prevented by the exhibition of opium, it then either acts as a ſudorific or diuretic.

There ſeems then ſtrong reaſon for thinking that emetics are of a noxious quality, ſince, as long as they remain in the body, they excite general uneaſineſs, and conſiderable evacuations.

Emetic ſubſtances do not produce one evacuation, but many; when they are in the ſtomach, they excite vomiting; when in the inteſtines, purging; and when in the blood veſſels, ſweating, or an increaſe of urine. In ſhort, whenever they get into the body, every effort is made to throw them out. How theſe evacuations are excited, I know no other mode of explaining than by referring to the *Vis Medicatrix Naturæ*.

This will be conſidered by many philoſophic perſons as a very unſatisfactory explanation, and little better than the hypotheſis of ſympathy; and there is no doubt that admitting of the *Vis Medicatrix Naturæ* as the cauſe of any effect, is rather cutting than untying the gordian knot. But although it is not a final explanation, yet it brings it to one common principle, with many other phænomena which take place in the human body: juſt as the floating of cork in water, and the ſinking of lead, are ſaid to be owing to gravitation; although gravitation itſelf is an aſſumed quality, the cauſe of which is entirely unknown.

The various ſymptoms which take place in vomiting are then explained in the following manner.

Emetics are conceived to be ſubſtances noxious to the human body. The nauſea is a ſenſation of an extremely diſagreeable kind, produced by the application of thoſe ſubſtances to the nerves; and, like all other blunt uneaſy ſenſations, occaſions a weakneſs in the pulſe, paleneſs, and debility. The violent exertion of the ſtomach and muſcles, which afterwards occurs, is an effort of the *Vis Medicatrix Naturæ* to expel the noxious matter; and this effort, like all other bodily exertions, is accompanied with a hurried circulation.

The purging, ſweating, and increaſe of urine, are ſuppoſed likewiſe to be efforts to expel the noxious ſubſtance from the inteſtines or blood-veſſels.

After the whole tumult is over, a conſiderable degree of debility and languor takes place: partly proceeding from the evacuation, and partly from that depreſſion which always follows great exertions.

There are ſome circumſtances, which ought to be particularly attended to, before we venture to give a full emetic. In the firſt place, they ſhould never be given where there is very great fulneſs of the veſſels, and where the florid complexion, and brightneſs or protuberancy of the eyes, together with pain, heavineſs and giddineſs of the head, ſhew that the veſſels of the brain may be overloaded or ruptured in the ſtraining to puke; in all ſuch caſes, bleeding, and that in pretty large quantities, ſhould always be premiſed. Emetics alſo ſhould be cautiouſly adminiſtered in caſes where we know that there has been, or have ſufficient reaſon to apprehend that there may be, a rupture of any conſiderable veſſel in the lungs: neither are they to be given if the ſtomach be inflamed.

The beſt means of applying an emetic is to give it in nauſeating doſes, whereby more is produced than the mere abſtraction of the natural ſtimuli; for medicines, which have the power of producing ſickneſs, leſſen the action, and even the general powers of life, for a time, in conſequence of every part of the body ſympathizing with the ſtomach, and their effects are pretty quick. Sickneſs lowers the pulſe; makes the ſmaller veſſels contract, and rather diſpoſes the ſkin for perſpiration, but not of the active or warm kind; but I believe it ſhould proceed no farther than ſickneſs; for the act of vomiting is rather a counteraction to that effect, and produces its action from another cauſe. It is ſimilar to the hot fit of an ague; a counteraction to the cold one. There are few ſo weak, but they will bear vomiting, but cannot bear ſickneſs long.

The medicines chiefly employed in this country are the ipecacuanha, and tartar emetic *.

The firſt is a Weſt-Indian root, of which there are two principal kinds, diſtinguiſhed by their colour, and brought from different places; but both poſſeſſing the ſame virtues, though in a different degree. The one is aſh-coloured or grey, and brought from Peru; the other is brown, and is brought from the Braſils: and theſe are indifferently ſent into Europe under the general name of ipecacuanha.

Theſe two ſorts have been by ſome ſuppoſed to be the roots of two different plants: but, according to others, this is a miſtake; the only difference being that one grows in a different place, and in a richer and moiſter ſoil, and is better ſupplied with juices than the other. The plant they belong to is a ſpecies of Pſychotria.

The aſh-coloured ipecacuan is a ſmall wrinkled root, bent and contorted into a great variety of figures,

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* Theſe appear to act upon different principles, for acids aſſiſt tartar emetic, whereas even a ſcruple of ipecacuan will have no emetic effect if given in half a glaſs of lemon juice.

figures, brought over in ſhort pieces full of wrinkles, and deep circular fiſſures, quite down to a ſmall white woody fibre that runs in the middle of each piece: the cortical part is compact, brittle, looks ſmooth and reſinous upon breaking: it has very little ſmell; the taſte is bitteriſh and ſubacrid, covering the tongue as it were with a kind of mucilage. The brown ſort is ſmall, and ſomewhat more wrinkled than the foregoing; of a brown or blackiſh colour without, and white within. The firſt ſort, the aſh-coloured or grey ipecacuan, is that uſually preferred for medicinal uſe. The brown has been ſometimes obſerved, even in a ſmall doſe, to produce violent effects. A third ſort, called the white from its colour, has alſo been diſtinguiſhed. It is woody, has no wrinkles, and no perceptible bitterneſs in taſte. This, though taken in a large doſe, has ſcarce any effect at all. It is ſuppoſed to belong to a ſpecies of Viola. Mr. Geoffroy calls this ſort baſtard ipecacuan, and complains that it is an impoſition upon the public. Geoffroy, Neumann, Dale, and Sir Hans Sloane, inform us, that the roots of a kind of apocynum (dogs-bane) are too frequently brought over inſtead of it; and inſtances are given of ill conſequences following from the uſe of it. But if the marks above laid down, particularly the aſh-colour, brittleneſs, deep wrinkles, and bitteriſh taſte, be carefully attended to, all miſtakes of this kind may be prevented.

Ipecacuan was firſt brought into Europe about the middle of the laſt century, and an account of it publiſhed about the ſame time by Piſo; but it did not come into general uſe till about the year 1686, when Helvetius, under the patronage of Lewis XIV. introduced it into practice.

This medicine is employed either in the wine or in the powder; and the latter, as operating in a ſmaller doſe, gives a more manageable emetic: for the powder is pretty certainly thrown out in the firſt vomitings, and therefore ceaſes to operate, whilſt the wine often adheres longer to the ſtomach.

The medicine in either form proves very certainly emetic; and the powder, to the quantity of a grain, or perhaps leſs in many perſons, can hardly be given without exciting nauſea and perhaps vomiting. Such ſmall doſes do not indeed always produce theſe effects; but as they frequently do, we mention them to ſhow that ſmall quantities often operate upon the ſtomach: and the inſtances of it make me ready to liſten to the accounts which have been reported of very ſmall doſes of this medicine.

Among theſe reports, however, I have difficulty in giving faith to thoſe of Dr. Pye, reported in the London Medical Obſervations, Vol. I. art. 22. whilſt he gives no account of the nature of the ipecacuanha that he employed, as different from, or of ſuperior power to, that in common uſe with us. In this, though I have often obſerved in certain perſons the effects of ſmall doſes above mentioned, yet they are not to be obſerved in every perſon; and I can aſſert, that in nine perſons out of ten they will hardly appear from doſes under five grains. For exciting vomiting, and eſpecially to excite repeated vomitings, we hardly depend on any doſe under ten grains, and frequently a larger doſe is required. It appears to me that the ſmall doſes would hardly anſwer our purpoſe without the aſſiſtance of warm water. Larger doſes indeed may be given with ſafety, becauſe, as we have ſaid, they are commonly thrown out in the firſt vomitings: but even on this account, they do not anſwer the purpoſe that may be required of repeated vomiting; and our practitioners commonly find, that to give any powerful or permanent ſtimulus to the ſtomach, it is neceſſary to add to the ipecacuanha ſome portion of emetic tartar.

℞ Ipecac. pulv.—ſcr. 1.
Antim. tart.—gr. 2.
F. pulv. emetic.

That is, take of

The powder of ipecacuanha—one ſcruple.
Tartarized antimony—two grains.
To make an emetic powder.

Perhaps the beſt mode of giving this powder is as follows.

℞ Ipecac.—ſcr. 1.
Antim. tart.—gr. 2.
Aq. font.—unc. 2.
F. miſt. emetic.

Cap. tertiam partem, et poſt quadrantem par horæ, repet. coch. min. 1. omni decem minutâ uſque ad vomitionem.

That is, take of

Ipecacuanha—one ſcruple.
Tartarized antimony—two grains.
Common water—two ounces.
To make an emetic mixture.

Take of this a third part, and after a quarter of an hour repeat a tea-ſpoonful every five minutes until it vomits.

The other is ſimple emetic tartar. Of theſe two ſubſtances, the ipecacuanha is by far the mildeſt in its operation; which is not ſolely owing to a difference in the doſe, becauſe when a doſe of tartar emetic is given, barely ſufficient to occaſion vomiting, it almoſt always operates with violence; whereas, when the doſe of the ipecacuanha is twice or three times larger than is neceſſary, it ſtill operates mildly.

The tartar emetic not only excites a much more violent action on the ſtomach, but it likewiſe generally operates either as a purgative or a ſudorific, or both; theſe latter effects are, without doubt, owing to ſome portion of the medicine not being thrown up during the vomiting.

On the other hand, a doſe of ipecacuanha ſeldom produces any other effect than vomiting, which probably proceeds from its being uſually all thrown up. It muſt naturally happen, that part of a diſſolved ſalt will be more apt to eſcape the action of the ſtomach, than a part of an undiſſolved powder. For the ſolution of tartar emetic will diffuſe itſelf through the fluids of the ſtomach ſo minutely, that if one drop of fluid remains in the ſtomach, that drop will have ſome of the tartar emetic in union with it. Repeated draughts of warm water being ſwallowed and thrown up, muſt always leſſen the quantity of tartar emetic; but it will hardly be poſſible to diſcharge the whole. Powdered ipecacuanha will be eaſier expelled by the action of the ſtomach, becauſe it does not diffuſe itſelf ſo minutely as a diſſolved ſalt.

This idea is confirmed by a fact mentioned by Dr. Cullen, who is a very accurate obſerver of the powers of medicines; namely, that the * powder of ipecacuanha is a more manageable emetic than the tincture †, becauſe " the tincture often *adheres* longer to the ſtomach."

By the expreſſion *adheres*, Dr. Cullen could only mean, that it remains longer in the ſtomach, and occaſions ſickneſs for a longer time than the powder; becauſe it is impoſſible for a ſubtle fluid like white wine literally to adhere. But, as in the tincture, the reſin of the ipecacuanha is in a ſtate of ſolution, it will be difficult to expel the whole; for the ſame reaſon that it is difficult to expel the ſolution of tartar emetic. But, although the tincture of ipecacuanha produces a ſevere and laſting ſickneſs, it ſeldom occaſions much purging or ſweating, like the tartar emetic. This is probably owing to its being a much weaker medicine. If a half or quarter of a grain of emetic tartar gets into the inteſtines, it will often excite a conſiderable evacuation; whereas it requires ſeveral grains of ipecacuanha to produce an equal effect.

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* Cullen's Treat. Mat. Med., vol. ii. p. 475.

† The tincture of ipecacuanha, or what is more commonly called ipecacanha wine, is taken thus; a tea-ſpoonful every ten minutes, until it vomits.

Almoſt all writers on the Materia Medica have obſerved, that powdered ipecacuanha acts with nearly equal powers, whether a ſmall or large doſe is ſwallowed: which is in all probability owing to this; that as ſoon as ever a ſmall portion of the powder is diſſolved, it occaſions nauſea and vomiting, and all of it is quickly expelled from the ſtomach. So that the quantity given is not very material, provided enough is ſwallowed to excite vomiting. No man, however, ought to venture to give an exceſſive doſe, depending upon this general fact; leſt the powder ſhould not all be expelled, and ſerious effects be produced.

The antimonial powder * of the London Diſpenſary is alſo employed as an emetic.

In this preparation, the antimony is not in a ſaline ſtate, like the tartar emetic, but in that of a calx.

Before

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* ℞ Antim. pulv.—gr. 3.
Glycyr. pulv.—gr. 7.
Mucil. G. arab.—gr. 1.
F. bolus ſtatim ſumendus.

That

Before this medicine can produce any effect upon the ſtomach, it muſt be diſſolved by its juices.

It is probably this circumſtance alone which is the cauſe of the difference between the action of the pulvis antimonialis and the tartar emetic in the human body.

Antimony is the baſis of both theſe medicines; but the tartar emetic, when exhibited, is in a ſaline and diſſolved ſtate, and capable of acting upon the nerves of the ſtomach as ſoon as it comes in contact with them; whereas the antimonial powder is in a calcined undiſſolved ſtate, and cannot excite any action till it is diſſolved.

The tartar emetic is conſequently much more apt to excite vomiting; and the antimonial powder is more apt to produce purging and ſweating.

It has often been tried to produce theſe effects, by exhibiting very ſmall doſes of tartar emetic, and repeating them frequently. But it is now pretty generally admitted, that by no management of tartar emetic, can it be made to excite ſweating and purging without vomiting, with ſuch ſucceſs as the antimonial powder. The ſlow and gradual ſolution of this calx lets looſe the antimony upon the ſtomach in a ſmall quantity at a time. A ſlight nauſea is

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That is, take of

Antimonial powder—three grains.
Liquorice powder—ſeven grains.
Mucillage of gum arabic—as much as is ſufficient.
Make a bolus to be taken immediately.

only

only felt, which is not ſufficient to occaſion vomiting. The antimony then paſſes into the inteſtines, and part of it is abſorbed, and purging and ſweating are produced.

The antimonial wine is a medicine alſo much in uſe. Its powers appear to be exactly the ſame with a ſolution of tartar emetic. It is not very eaſy to aſcertain the exact comparative ſtrength of theſe medicines; but, as far as I can judge, a grain of emetic tartar * is nearly equal to a dram of antimonial wine.

Ipecacuanha and antimony are conſidered as ſo decidedly the beſt and moſt manageable emetics, that it is hardly neceſſary to treat of the others.

The only remaining emetic perhaps that may require any attention is that of ſquills, and this has been frequently ordered by Dr. Thornton with

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* The emetic tartar is preſcribed from 2 to 5 grains. The following is a very good formula.

℞ Antim. tart.—gr. 4.
Ag. menth. ſativ.—unc. 6.
Syr. croci—dr. 2.

M. ſum. coch. larg. 2 omni quadr. hor.
Donec vomitus moveatur, vel ad nauſeam creandam.

That is, take of
Tartariſed antimony—four grains.
Simple peppermint water—ſix ounces.
Syrup of ſaffron—two drachms.

For a mixture. Take of this two table-ſpoonsful every quarter of an hour until vomiting is produced, or a violent nauſea.

much advantage, eſpecially in inflammation of the lungs. The formula is,

Tinct. ſcillæ—unc. 3.

Cap. coch. min. 1. omni quinque minutâ uſque ad vomitionem.

That is,

Tincture of ſquills.

Take a tea-ſpoonful of this every five minutes until vomiting comes on.

I need mention but one more, which is an infuſion from half a drachm to a drachm of the dried leaves of tobacco, or of theſe as they are commonly prepared for chewing, for an hour, or more, in four ounces of boiling water, affords an emetic which produces great nauſea and depreſſion, but as the ſickneſs is leſs manageable in both theſe laſt, than with the ipecacuan and emetic tartar, and appear, what practitioners would term, extremely inelegant, their ſpecific powers have not been as yet ſufficiently aſcertained.

It may be proper here juſt to mention that to bring up opium the beſt emetic is zinc *, and where arſenic, or corroſives, are taken, we ſhould employ ipecacuan, or uſe oil, or butter.

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* The formula is,

Zinc vitriolat.—ſcr. 1.

Aq. tepid unc. 4, ſolve ut ft. hauſ. emetic.

That is,

A ſcruple of vitriolated zinc diſſolved in four ounces of water for an emetic.

PRACTICAL OBSERVATIONS.

SECT. LXXXIII.

PURGING.

Purging abates an intenſeneſs of motion in the vaſcular ſyſtem, on two accounts; firſt, as it draws off a conſiderable quantity of animal fluid, of courſe leſſening the force of the motory fibres in general, and thoſe of the heart and arterial tunics in particular; and, ſecondly, as it clears the inteſtines of many acrid and ſtimulating matters, which by their ſtay would neceſſarily keep up an unuſual degree of irritation.

Hence it is of great ſervice in all caſes where the motions of the vaſcular ſyſtem are raiſed much above the healthy rate, to ſubjoin the uſe of cathartics to the letting of blood; or even frequently to give them previous to veneſection.

The ſubſtances uſed for emptying downwards through the alimentary canal are diſtinguiſhed into ſuch as are lenient; opening the belly but gently; and ſuch as are draſtic, and purge briſkly. Their action conſiſts in irritating the ſenſible fibres of the inteſtines, whereby not only the periſtaltic motion is accelerated, but alſo the ſecretion of mucus and lymphatic vapour, which ouze every where into the cavities of the inteſtines, is increaſed, as well as unuſual quantities of pancreatic juice and bile derived from their ſeveral ſources. Hence we may eaſily judge how great a quantity of humours may be carried off by one briſk purge, and in how ſenſible a degree the whole maſs of fluids may be thereby decreaſed.

Conſequently it is obvious, that the evacuation by ſtool may be ſo large as to diminiſh the quantity of fluids in the whole ſyſtem; and therefore, that whenever ſuch a diminution is indicated, it may be obtained by the uſe of ſuch medicines: and I need not ſay that particularly by this means any preternatural increaſe of the activity, or of the active powers of the ſyſtem, may be thus greatly diminiſhed.

It is at the ſame time however to be remarked, that although by purging a great debility of the ſyſtem may be induced, it may not produce any great evacuation of the ſanguiferous ſyſtem. A large evacuation by ſtool may ſometimes be merely of the contents for the time preſent in the inteſtines, and therefore not drawn from the blood-veſſels; and though the evacuation may be ſtill larger by what is drawn from the mucous follicles, this we know may be very copious from the matter contained in the follicles themſelves, without much liquid being drawn from the blood-veſſels. The evacuation indeed may alſo be increaſed by what is drawn from the arteries by the exhalant veſſels; but as this muſt be drawn off ſlowly in very divided portions, it can have little effect, and at leaſt no ſudden effect in the depletion of the ſanguiferous ſyſtem: and from the whole it will appear, that the evacuation by ſtool may be very large, without much effect in taking off the tenſion and tone of the blood-veſſels. In this reſpect, indeed, it ſeems to fall far ſhort of the powers of blood-letting, though this be contrary to the common opinion, and even contrary to the practice of SYDENHAM: for in truth we have not found purging to be of ſo great effect in taking off the phlogiſtic diatheſis of the ſyſtem as the other.

Beſides the general evacuation of the whole ſyſtem, purging is powerful in changing the diſtribution of the blood into the ſeveral parts of it.

The circumſtances according to which the diſtribution of the blood is made into the ſeveral parts of the ſyſtem, we ſuppoſe to be commonly known, and to this effect, That if an evacuation is made from one ſet of veſſels, the afflux of fluids will be increaſed in theſe, and that the afflux into other parts of the ſyſtem will at the ſame time be diminiſhed. Upon this principle it will be readily underſtood, that if the affiux of fluids in the deſcending aorta is increaſed, as it muſt be by purging, the afflux muſt in ſome proportion be diminiſhed in thoſe veſſels which carry the blood to the head. By this the quantity and impetus of the blood in the veſſels of the head muſt be diminiſhed by purging; and hence it is that this operation of cathartics has been found ſo extremely uſeful in the diſeaſes of the thorax.

With reſpect to the choice of purgatives, the neutral ſalts have been uſually preferred.

As they do all that can be effected by an evacuation from the inteſtines, without acting ſtrongly upon the moving fibres, they give no ſtimulus, or at leaſt no inflammatory ſtimulus, to the whole ſyſtem, and are therefore moſt uſefully employed when any phlogiſtic diatheſis prevails in it.

The whole of the neutral ſalts may be employed for theſe purpoſes, but ſome of them more conveniently than the others.

That formed of the fixed acid of vitriol with the vegetable fixed alkali*, from its being of difficult ſolution, is not a convenient medicine; but if the neutral be formed of the ſulphureous, or volatile vitriolic acid, when it comes under the title of Sal Polychreſtus†, this, to perſons who can bear its odour, taken from one dram to four, proves a very convenient laxative. But I muſt remark here, that thoſe apothecaries miſtake the matter much who take the reſiduum of the diſtillation of Glauber's acid of nitre for the ſal polychreſtus.

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* Potaſh.

† Sulfate of potaſh.

The vitriolic acid with the foſſil alkali *, gives the neutral named Glauber's ſalt †, in very frequent uſe; and which indeed, on every occaſion, ſerves the purpoſe of the neutrals.

It is now well known, that ſuch a neutral may be made of the vitriolic acid with either the foſſil alkali or with magneſia alba ‡; and from every obſervation I can make, there ſeems to be no difference in the two compoſitions for all the purpoſes of a neutral ſalt.

The nitrous acid with either of the alkalines gives laxative neutrals; but they are not conveniently employed in practice, becauſe the quantity that is neceſſary to be a laxative doſe is commonly very diſagreeable to the ſtomach.

The muriatic acid gives neutrals which may be employed when largely diluted; but to moſt perſons the ſalt taſte is diſagreeable, and large doſes are ready to excite an uneaſy thirſt, that continues after the operation of the ſalt is over.

The vegetable acids, either native or fermented, give neutrals that may be employed; but they are

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* Soda. † Sulfate of ſoda.

‡ Carbonat of magneſia.

not very powerful, and therefore ſeldom conveniently uſed as laxatives.

It is the acid of tartar* that gives ſome of the moſt convenient laxatives; and they are prepared by ſaturating the cryſtals with the quantity of alkali neceſſary to render the whole exactly neutral. For this purpoſe, either the fixed vegetable or foſſil alkali may be employed. The former gives the tartarum ſolubile, or alkali tartariſatum †; and the latter gives the ſal Rupellenſis, or natrum tartariſatum ‡. The tartarum ſolubile is not eaſily brought into a cryſtalline ſtate, or kept in a dry form; whilſt the ſal Rupellenſis has not either of theſe diſadvantages. It is of a leſs diſagreeable taſte than almoſt any other neutral; and as anſwering every purpoſe for which theſe can be required, I expect it will come to be very generally employed. As the acid of tartar is of a weaker attraction than almoſt any other acid, ſo it may be often diſlodged by the acid of the ſtomach, and this often renders the operation of the tartarum ſolubile leſs certain, as the combination of the alkali with the acid of the ſtomach is a leſs powerful laxative; but the ſal rupellenſis is not liable to this diſadvantage, as the acid of the ſtomach combined with the foſſil alkali is ſtill a tolerably powerful laxative.

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* Tartarous acid.

† Tartrite of potaſh.

‡ Tartrite of ſoda.

The next that preſents itſelf to us is rhubarb. Much pain has been taken to aſcertain the ſpecies of this genus that gives the root which the phyſicians of Britain have conſidered as the ſpecies of greateſt value, and ſuch as has been imported under the name of Turkey Rhubarb. Whether this may be exactly determined or not, I cannot clearly judge; and in the mean time, I do not think it neceſſary to proſecute the matter farther with any anxiety, as we have now got the ſeeds of a plant whoſe roots, cultivated in this country, ſhow all the properties of what we conſidered as the moſt genuine and valuable rhubarb; and which, if ſuffered to grow old, and being properly dried, will in time ſuperſede the importation of any other.

The qualities of this root are that of a gentle purgative; and ſo gentle that it is often inconvenient, by reaſon of the bulk of the doſe required, which in adults muſt be from half a dram to a dram. When given in a large doſe it will occaſion ſome griping, as other purgatives do; but it is hardly ever heating to the ſyſtem, or ſhows the other effects of the more draſtic purgatives.

The purgative quality is accompanied with a bitterneſs, which is often uſeful in reſtoring the tone of the ſtomach when it has been loſt; and for the moſt part its bitterneſs makes it ſit better on the ſtomach than many other purgatives do. Its operation joins well with that of the neutral laxatives;

and

and both together operate in a leſſer doſe than either of them would do ſingly.

The preſent is an excellent formula,

℞ Rhei pulv. ſcr. 1.
Kali vitriolat. ſcr. 1½.
Aq. Cinnam.
Aq. Menth. Pip. *aa* dr. 7.
F. Hauſtus.

That is, take of

Rhubarb—a ſcruple.
Vitriolated Kali—a ſcruple and a half.
Cinnamon Water.
Simple peppermint water, equal parts—ſeven drachms.
To make into a draught.

Sometimes, to quicken its operation, addere liceat,

Antim. tart. gr. ½.

It is proper to add of

Tartarized antimony—half a grain.
Vel Jalapii pulv. gr. 6.
Or, of Jalap in powder—ſix grains.

Vel Calomel. gr. 2.
Or, of Calomel—two grains.

The next purgative which claims our conſideration is Jalap. Here is a medicine of certain and great efficacy. Even to the eye-ſight the entire root contains a reſinous part; which can, in conſiderable quantity, be extracted from it by ſpirit of wine, leaving the reſiduum nearly quite inert. The reſin thus ſeparated is an acrid inflaming matter, which, thrown into the ſtomach, proves a draſtic purgative; but it is rendered milder by being divided by a triture with any hard powder before it be exhibited. It is certainly by its reſinous part that the entire jalap proves purgative, and in large doſes proves a ſtrong one; but as it is given in powder, the previous triture, by dividing the reſin, renders the entire jalap a milder medicine than the reſin taken ſeparately. It may be given to perſons not very irritable to half a dram for a doſe, but leſſer doſes will commonly anſwer; and while it very certainly operates, it is commonly without violence, and often without griping. If it be well triturated, before exhibition, with a hard powder, and the cryſtals of tartar * are the fitteſt for the purpoſe, the jalap will operate in leſſer doſes than when taken by itſelf, and at the ſame time very moderately and without

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* ℞ Jalap pulv.—gr. 8.
Tart. Cryſtal pulv.—dr. ½.
F. pulv. ſtatim ſumend.

That is, take of
Jalap in powder, eight grains.
Cryſtal of tartar, half a drachm.
Make into a powder to be taken immediately.

without griping. Except when given in very large doſes, I have not found it to be heating to the ſyſtem; and if it be triturated with a hard ſugar, it becomes, in moderate doſes, a ſafe medicine for children, which in this form they will readily receive, as the jalap of itſelf has very little taſte.

While jalap may be thus rendered mild and ſafe, it may, however, by being given in large doſes, and eſpecially by being joined with calomel, which has no taſte, be rendered one of the moſt powerful purgatives, and, if we miſtake not, more ſafe than any of the other draſtic purgatives.

For the ſake of dear children, whoſe reaſons are not ſtrong enough, nor our influence over them, often ſufficient, to get them to take nauſeous medicines, I muſt add one more purgative, which is ſufficiently mild and quick, I mean ſenna *, which may

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* Take of the leaves of ſenna, deprived of the ſtalks, a drachm, and pour boiling water over it, and give a cup of this occaſionally. How far preferable is this to the common practice of always giving *calomel* only, becauſe children will take it, forgetful of the frightful conſequences that often enſue.

For grown up perſons the following are the beſt formulæ.

℞ Infuſ. ſen. ſimp. unc. 3.
Antim. tart. gr. 1.
M. F. Hauſtus ſtatim. ſumend.

may be made into tea, ſweetened, and milk put to it, or cream, when it becomes, if not made too ſtrong, ſufficiently palatable, and a cup may be given every hour and a half until it operates.

That is, take of
Simple infuſion of ſena—three ounces.
Tartarized antimony—one grain.
To be made into a draught, to be taken immediately.

Or,
℞ Inf. ſen. ſimp. unc. 3.
Natr. vitriolat. unc. $\frac{1}{2}$.
Sp. Piment. dr. 2.
F. Hauſtus ſtatim. ſumend.

That is, take of
Simple infuſion of ſena—three ounces.
Vitriolated natron—half an ounce.
Spirit of allſpice—one drachm.
To be made into a draught, to be taken immediately.

PRACTICAL

PRACTICAL OBSERVATIONS.

SECT. LXXXIV.

BLISTERING, AND OTHER TOPICAL APPLICATIONS.

IT might appear at firſt ſight, that bliſtering is not the abſtraction, but the addition of a powerful ſtimulus, and as ſuch it is ſometimes given to rouſe the animal œconomy. Its firſt action is certainly that of ſtimulating: but in this it invites the blood to the ſurface, deriving from the part moſt ſuffering by inflammation, and by its action expends the irritable principle, which becomes engaged in pouring out ſerum under the cuticle, and hence the abſtraction of ſo much of a ſtimulus, thereby diſcharged. It is a kind of half bleeding. The after proceſs of healing is another expence of the irritable principle.

Where the throat is inflamed, hartſhorn and oil mixed in equal parts, and put upon a flannel, is an excellent application round the throat.

From this principle bliſters are put behind the ears for inflammation of the eyes, and ſetons are cut in the arm.

There are, however, other applications in uſe, which directly meet our principle. In inflammation of the liver it is cuſtomary to apply wet cloths dipt in a frigorific mixture over the abdomen, and as often as the cloths get warm freſh cooling applications are applied. This was lately done by Dr. Garthſhore, in a caſe of peritonæal inflammation, which in half an hour produced the greateſt eaſe, and ſunk the pulſe from a hundred and twenty to ninety. This practice is new, and deſerves every attention.

In inflammation of the eyes there is nothing ſo good, as keeping a rag conſtantly wet over the eye, the uſual application is roſe water.

The effect of a poultice ſeems to be founded entirely upon this principle, for it ſeldom when firſt put over an inflamed part is more than ninety-ſeven degrees of heat, and ſoon ſinks below that, and the quantity of aqueous matter, riſing in the form of vapour, produces an additional abſtraction of heat.

PRACTICAL OBSERVATIONS.

SECT. LXXXV.

REFRIGERANTS.

THESE are medicines ſuppoſed, as their title implies, to diminiſh the heat of the living body.

As the neutral ſalts, which are the refrigerants chiefly employed, do, upon being diſſolved in water, generate a conſiderable degree of cold; ſo it has been ſuppoſed that they may in like manner generate cold in our bodies, and therefore produce their effects as by an actual cold applied. See Brockleſby's Obſervations, p. 122.

This concluſion, however, will readily appear to be miſtaken, when it is conſidered that the cooling power of theſe neutral ſalts in water appears only during the time of their ſolution. When taken indeed undiſſolved, they may, as in Brockleſby's and Alexander's experiments, generate cold in the ſtomach, and from thence have particular effects: but as after ſolution they produce no permanent cold;

ſo,

ſo, when taken in a diſſolved ſtate, as they commonly are, their refrigerant powers cannot be aſcribed to any actual cold applied.

The concluſion drawn from their ſolution in water further appears to be very erroneous, from this; that acids, which are as powerfully refrigerant in the human body as the neutrals, do however, upon being mixed with water, always generate heat; and even the neutral ſalts, when any how deprived of the water neceſſary to their cryſtalline ſtate, do, upon that water's being reſtored to them, always generate heat. It is not therefore any thing in the nature of the ſaline matter that has a power of generating heat or cold in water or other bodies, but that the appearance of ſuch a power depends entirely upon the circumſtances of ſolution or mixture, and appears no longer than theſe circumſtances ſubſiſt.

They produce, upon this principle, however, great good in inflammations of the fauces, and I have known a ſore throat in the forming ſtage, cured in a few hours by putting pieces of nitre in the mouth, which gradually diſſolves, and the ſaliva is ſwallowed. I have found it almoſt an infallible preventive.

At the head of the liſt of refrigerants acids are uſually placed; and although theſe might come under ſome other of our general titles *, I ſhall here

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* As a tonic.

conſider all their ſeveral powers and virtues as refrigerants.

It might be expected that I ſhould here, in the firſt place, enumerate all the ſeveral ſubſtances which may be, and generally are, comprehended under this general title; but this I find would be a difficult, and we hope it is an unneceſſary work. The chemiſts of late have been diſcovering a great number of different ſpecies of acids that were not known before; and it is probable that their inquiries are not yet finiſhed; but in the mean time, it appears, that although it was very proper for the purpoſes of chemiſtry to mark and aſcertain the diverſity of acids, yet as few of the whole number have been employed as medicines, and that we are at leaſt uncertain how far ſeveral of them may be employed as ſuch, it does not ſeem neceſſary for us to take notice of any but thoſe which we know to have been employed in the practice of phyſic.

In doing this, we ſhall in the firſt place mention the medicinal qualities which we ſuppoſe to be in common to all the ſpecies of acids employed in phyſic; and ſhall afterwards conſider how far theſe qualities may be anywiſe different in the particular ſpecies.

Upon this plan, the quality firſt to be mentioned is that of their refrigerant power. This we ſuppoſe to be eſtabliſhed by the experience of all ages; and practitioners ſtill conſtantly employ them in every

caſe

caſe in which the heat of the body is preternaturally increaſed; and although there may be ſome of the other qualities of acids which may not be ſuited to the conſtitution of certain perſons, yet as to this quality there are hardly any exceptions.

Theſe effects, however, are not very evident to our ſenſes, nor are eaſily ſubjected to experiment; becauſe they cannot be remarkable in conſequence of any one exhibition; and the effects are only found in conſequence of frequent repetitions. It is proper, therefore, that we ſhould confirm it by other obſervations.

One is, that any preternatural heat ariſing is accompanied with thirſt; which eſpecially directs to the choice of acids: and as inſtincts may be commonly ſuppoſed to be ſuited to the purpoſes of the animal œconomy, ſo this deſire of acid is preſumed to be a proof that theſe are ſuited to moderate the heat that is the cauſe of thirſt.

Another conſideration may be, that acids eſpecially abound in warm climates and warm ſeaſons; and therefore, that nature has made this proviſion of what is ſuited to moderate the heat of the human body, ariſing in ſuch climates and ſeaſons*.

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* Vide Vol. II. page 36, where the rationale of the cooling properties is attempted to be explained.

VITRIOLIC ACID *.

When it is to be employed for internal uſe, it muſt be largely diluted with water; and the diſpenſatories have ordered ſeven or eight parts of water to be added to one of the concentrated acid. The proportion of water is not a matter of much nicety; but

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* Vitriolic acid, (new name, the acidum ſulphuricum) is generally in a liquid form. It exiſts in various metallic and earthy bodies, but is chiefly obtained from green vitriol, and from ſulphur; 16 oz. of the latter forming 9 oz. of the acid.

It is the ſtrongeſt of all acids, and has the greateſt ſpecific gravity; the proportion of which to diſtilled water, is as 1800 to 1000. It generates much heat with water; becomes dulcified, that is, loſes its acidity, when incorporated with ſpirit of wine; diſſolves iron, zinc, and copper; and with boiling heat may be united to all metals. It corrodes all animal and vegetable ſubſtances, checks fermentation, and neutralizes alkalies; and will become volatile, by mixing it with liver of ſulphur, made with cauſtic alkali; but in this volatile ſtate its affinities and powers are much diminiſhed.

Stahl, the ſcholar of Becher, and promulgator of the phlogiſtic doctrine, derived the vitriolic acid from ſulphur, deprived of phlogiſton. The French chemiſts declare it to be a compound of ſulphur, a ſimple ſubſtance, and oxygen, attracted from atmoſpheric air during combuſtion.

Diluted or weak vitriolic acid, (new name, acidum ſulphuricum aqua dilutum).—This was lately called ſpiritus vitrioli tenuis, and is frequently ordered inſtead of the elixir vitrioli acidum but it is proper for the ſake of preſcribers that it ſhould be fixed, which, however, cannot be done without determining the ſpecific gravity of the concentrated acid, which neither of the colleges have done.

Even the diluted acid is ſeldom employed in any precise doſe, but mixed with water, or with tinctures or infuſions, in ſuch quantity as the patient's palate will eaſily bear. This however is a very inaccurate practice, as it generally occaſions the doſe of the acid to be too ſmall. In my opinion, it would be better to fix the quantity of acid, and leave it to be diluted to what the patient's palate may require.

The ſimple acid properly diluted, and ſweetened perhaps with a little ſugar, is generally grateful to the palate, and is of ſervice in quenching thirſt. When it is carried down into the ſtomach, it is uſeful in curing the nauſea which ariſes from any

acidum of the former diſpenſatory. The doſe may be from 10 to 30 drops.

The following is an excellent formula.

℞ Infuſ. roſæ unc. 7.
Natr. vitriolat unc. $\frac{1}{2}$.
Capt. coch. larg. 4, ſextâ quâque horâ.

That is, take of
The infuſion of roſes—eight ounces.
Vitriolated natron—half an ounce.
Take four table ſpoonſful every four hours.

putrid matters there; and either by this means, or by its ſtimulus applied to the ſtomach, it excites appetite, and conſequently promotes digeſtion.

I have never found that, in any quantity, the vitriolic acid mixed with the bile proved laxative, as the vegetable acids ſo readily do.

NITROUS ACID *.

This acid, from its being ſo commonly employed in chemical operations under the title of aquafortis, has probably, from the opinion of its corroſive nature,

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* Nitrous acid, (new name, acidum nitricum).—Nitre is a neutral ſalt, compoſed of an acid and an earthy baſis, impregnated with animal or vegetable matter. This acid may be ſeparated by the force of fire, but is much more eaſily obtained by the aſſiſtance of a proper quantity of vitriolic acid; the latter having a greater affinity to the alkaline part ſets free the nitrous acid, which by diſtillation, is carried over into the receiver.

This acid is commonly in a fluid ſtate, of a reddiſh colour, and emits noxious fumes; it is ſpecifically lighter than vitriolic acid, effervesces ſtrongly with oils and vinous ſpirits, diſſolves moſt metallic, and all kinds of animal and vegetable ſubſtances, generates cold, increaſes inflammability, and promotes fuſion. Expoſed to intenſe heat, it produces a large portion of pure air: 13½ dr. of this acid will ſaturate 1 oz. of ſalt of tartar, or prepared kali. The more concentrated it is, the more volatile, the more diluted, the more fixed. The ſpecific gravity to the weight of diſtilled water, is as 1550 to 1000.—*White.*

nature, prevented phyſicians from employing it as a medicine. This however was a miſtake*; for this acid, properly diluted, may be very ſafely employed, and has all the powers and virtues of acids in general. Though the inſtances are few, there is one in Boerhaave's *Nitrum Nitratum*, in which the acid is in greater proportion than is neceſſary to ſaturate the alkali; and I have frequently, ſays Cullen, employed it as a grateful and cooling medicine.

Diluted nitrous acid, (new name, acidum nitricum aqua dilutum).—The vapour which riſes in mixing theſe fluids, is nitrous acid air. This acid is uſed as a menſtruum, and in a few particular preparations.

This is uſed as the vitriolic acid, but in a larger doſe.

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[*] It has of late been ſo much employed in venereal caſes, that we may in future venture more freely upon its uſe, and probably greatly augment the quantity given of the other mineral acids.

The proper formula may be.

℞ Acid. nitros dr. ½.
Decoct. hordei. lb. 2. M.
Bibat æger quotidie, ope tubuli vitrei, a libra una ad libras duas uſque.

That is, take of
The nitrous acid—half a drachm.
Barley water, or thin gruel—a quart, thin.
Let the patient drink, by means of a glaſs tube (a quill may ſerve the purpoſe) from one to two pints daily.

At preſent cremor tartar drink is moſt common.

MURIATIC OF MARINE ACID *.

In the laſt century Glauber took great pains to introduce the uſe of this acid, aſcribing many virtues to it both in diet and medicine. Hence it happened that phyſicians employed it a good deal in the diſeaſes of the ſtomach; and many have been of opinion, that in reſtoring the tone of the ſtomach, it operates more powerfully than the vitriolic: but as the latter can be more eaſily brought to a ſtand-

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* Muriatic acid, or marine acid, is generally procured from ſea ſalt, which is compounded of foſſil alkali, or natron, and muriatic acid. It may alſo be obtained from vegetables, foſſils, urine, ſoot, &c. In this proceſs likewiſe the vitriolic acid is commonly employed to decompoſe the ſalt, and to ſet the marine acid at liberty. The neutral ſalt left in the retort is, when cleanſed, the vitriolated natron, or Glauber's cathartic ſalt, viz. the alkaline baſis of the ſea ſalt, and the vitriolic acid united.

The marine acid acts readily on metallic bodies, and has a greater affinity to moſt of them than other acids. It does not touch gold in its metallic ſtate, except mixed with eight times its quantity of the nitrous acid, which forms an aqua regia. It mixes readily with ſpirit of wine, and affords a true æther. When concentrated, it is of a yellow colour, and oily particles float on its ſurface. Its ſpecific gravity to that of diſtilled water, is as 1170 to 1000.

This is the weakeſt of the mineral, but ſtronger than the vegetable acids, and is chiefly uſed as a menſtruum. It is given to adults in doſes of 10 to 40 gtt. or more, with draughts of diluting liquors.—*White.*

ard than the other, it has entirely thrown this other out of our practice. Although the London college, in the laſt edition of their Diſpenſatory, have omitted both the ſimple ſpirit of ſalt and the ſpiritus ſalis dulcis, yet the Edinburgh college have retained both: and wherever the latter is employed, I conſider it as an employment of the acid; for, in the ordinary preparation of it, the qualities of the acid are never entirely deſtroyed.

But the moſt remarkable inſtance of the employment of this acid was in the tinctura aperitiva moebii, which Dr. Hoffman informs us was, in the courſe of the laſt century, much employed and celebrated for its virtues. Dr. Hoffman informs us that it conſiſted of a ſolution of common ſalt ſuperſaturated with its acid. I have frequently employed it by making a ſolution of half an ounce of good bay ſalt in four ounces of water, adding to this two drachms of a well-rectified ſpirit of ſalt; and this given in a tea ſpoonful or two in a glaſs of water I have found uſeful in improving appetite, and frequently in ſtopping vomiting.

Acids I ſhall conſider as of three kinds; the native, the diſtilled, and the fermented.

The native acids are chiefly thoſe found in the fruits of plants, ſometimes however alſo in the leaves and roots. They are in different degrees of acidity, and different by the texture of the fruit in which they are lodged; and ſtill more conſiderably by the various matter adhering to them, both in the fruits and in the juices expreſſed from theſe.

The effects of theſe different conditions in the uſe of them as aliments I have endeavoured to explain when treating of them above *; but, as medicines, I do not find that I can apply any diſtinction of them. Although they may be diſtinguiſhed in a chemical view, I do not find that I can apply ſuch diſtinctions to the purpoſes of medicine; and that, with a view to this, I muſt conſider them in general, and merely as acids. In conſidering them therefore as medicines, I muſt obſerve, in the firſt place, their refrigerant power; and that, eſpecially upon account of the quantity in which they may be given, they are the moſt effectual of any we can employ. As we have ſaid above, that they enter into the compoſition of the animal fluid *, and thereby diminiſh the putreſcent tendency of this, they therefore, as I judge, obviate the heat that might otherwiſe ariſe; and it is in proof of all this that they are the moſt ready and certain cure of ſcurvy.

The ſame acids are never in ſuch a concentrated ſtate as to ſhow any cauſtic or even ſtimulant powers; but they ſhow readily the ſtimulant power which is in the weaker or much diluted acids, ſo far as they excite appetite and promote digeſtion: and probably it is by the ſame power that they excite the urinary excretion.

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* Vide Vol. II. page 36.

All theſe powers are to be aſcribed to the pure acid that is in this native acid of vegetables; but it is now to be remarked, that in all of them, even the moſt purely acid, there is preſent a quantity of fermentable matter: and if this happens to be in large proportion, or even in ſmall proportion, and thrown into the ſtomachs of an aceſcent diſpoſition, the acid undergoes a fermentation, which is attended with flatulency, a more powerful acidity, and all the other ſymptoms which we term Dyſpeptic. This does not however much affect their refrigerant power, or do much harm to the ſyſtem, except in thoſe caſes of gout and calculus renalis, in which the taking down the tone of the ſtomach may be very hurtful. It ſeems to be in conſequence of this aceſcent diſpoſition of the ſtomach that a more copious acidity, and perhaps of a peculiar kind, united with the bile, forms a laxative which may occaſion more or leſs of diarrhœa, and the cholic pains which ſo frequently accompany the operation of laxatives.

DISTILLED ACID OF VEGETABLES.

All vegetables except muſhrooms, if theſe be truly ſuch, when treated by diſtillation without addition, give out, in the firſt part of the diſtillation, a quantity of acid, and continue to give out more during the whole of the diſtillation. This acid is ſomewhat different according as it is drawn from different vegetables: but that difference has not been aſcertained; and we know them even in chemiſtry, and more certainly in medicine, only by the common quality of acid.

This acid has been but little employed as a medicine, and has hardly been remarkable but by its late uſe in the form of tar-water. In making tar, it is exhaled from vegetables whilſt they are burnt, in the ſame manner as in the diſtillation above mentioned; and accordingly, in the making of tar, an acid water is found in conſiderable quantity in the ſame ditches that are prepared for receiving the tar during the burning of the wood. In the countries where tar is prepared, particularly in North America, this acid was accidentally employed as a medicine. It was found to prove very uſeful; and the benevolent and worthy Biſhop Berkeley being informed of this, was deſirous of rendering ſuch a medicine very generally known. But as the water collected, as we have ſaid, during the burning of the wood, could not properly or conveniently be obtained in Britain, he perceived that a quantity of the acid remained in the tar as it was imported, and conceived that it might be extracted from it by infuſion in water. It is ſuch an infuſion that gives the celebrated tar-water which has been ſo much talked of.

It was at firſt by many perſons celebrated as a very valuable medicine; and, from my own obſervation and experience, I know it in many caſes to be ſuch. But, as happens in all ſuch caſes, the commendations of it by the patrons and favourers of it were very often extravagant and ill founded; and though the perſons who diſparaged it had ſome foundation for their opinions, yet they alſo told many falſehoods concerning it.

Although it would have been difficult, at that time, to balance between theſe oppoſite accounts; yet, in the courſe of ſixty years, the matter has found its own balance. The exceſſive admiration of it has entirely ceaſed, and the moſt part of practitioners, from cauſes we could aſſign, have neglected the uſe of it; but there are ſtill many judicious perſons who believe in and employ its virtues. In many inſtances this preparation has appeared to ſtrengthen the tone of the ſtomach, to excite appetite, promote digeſtion, and to cure all the ſymptoms of dyſpepſia. At the ſame time it manifeſtly promotes the excretions, particularly that of urine; and the ſame may be preſumed to happen in that of others. From all theſe operations it will be obvious, that in many diſorders of the ſyſtem this medicine may be highly uſeful.

It may be however, and has been a queſtion, upon what, in the compoſition of tar-water, theſe qualities depend: and I have no doubt in aſſerting that it is entirely upon the acid produced in the manner above mentioned. Mr. Reid, the author of a diſſertation on this ſubject, has rendered this ſufficiently probable, from the accounts of Glauber and Boerhaave with reſpect to the virtues of ſuch an acid, and from the opinion of the Biſhop of Cloyne in preferring the Norway tar to that of New England, as the acid part is not taken from the former ſo entirely as it is from the latter; and he alſo properly ſupports it by this, that any other parts of the tar-water which may be found in it, unleſs carefully ſeparated, are commonly very hurtful.

Upon the firſt introduction of tar-water, ſome phyſicians were of opinion, that it derived part of its virtue from ſome oily matter in its compoſition; but it would not be difficult to ſhow, that this, in many reſpects, is very improbable, and that, upon the contrary, the preſence of theſe oils, as Mr. Reid has particularly pointed out, is frequently pernicious. But, to ſuperſede all controverſy on this ſubject, I can aſſert from much experience, that the tar-water, as it abounds in acid, and is more free from all oily matters, is the moſt effectual medicine: and I have this clear proof of it, that when, inſtead of extracting the acid by infuſing the tar in water, I procured it by diſtillation from ſolid fir or other woods; and, by taking only the firſt part of the diſtillation, I obtained the acid as free as poſſible from all oily matter. I found that by employing this acid as a medicine properly diluted with water, every virtue appeared that was ever found in any tar-water. In this practice I found a particular advantage, as I could, by a proper rectification and concentration, bring the acid into a ſmall bulk; which being readily portable, is, on occaſion of journeys, or other circumſtances, rendered very convenient. But it is very neceſſary to obſerve here, that this acid, to be rendered a very uſeful remedy, muſt be always largely diluted with water; and how much the water may favour its operation in every reſpect will be ſufficiently obvious.

ACID OF VEGETABLES.

This is the well known liquor named Vinegar, the preparation of which need not be given here. As it is found in our houſes and ſhops it is in different conditions, the cauſes and circumſtances of which are not well aſcertained; and we can only judge of its purity by the ſharpneſs of its acid taſte, and its being free from all others.

As this acid is prepared by fermentation, it is always in a diluted ſtate; and, both for the purpoſe of medicine and of pharmacy, it has been deſirable to be obtained in a more concentrated condition. The purpoſes and the execution of this are various; but the moſt ordinary practice has been by diſtillation, which ſeems to me not to be the moſt proper: for the diſtillation cannot be practiſed without the acids becoming empyreumatic, which always renders it a diſagreeable medicine; and at the ſame time, by the ordinary practice, the acid is hardly or not at all rendered ſtronger than it might have been by a proper fermentation. The directions of the London College I could never follow with any exactneſs; and I have always found, that before the aqueous part be drawn off, an empyreuma is communicated to the whole liquor.

The Edinburgh directions may be exactly executed; but the empyreuma is made very ſtrong, and at the ſame time the diſtilled acid, as I have ſaid, is hardly ſtronger than it is in good vinegar; and I know of no advantage that this diſtilled acid has over the other.

If a concentrated vinegar is much to be deſired, there are two other ways of obtaining it. The one is by freezing, which has now been frequently practiſed in the northern countries of Europe; and the management of it is preſcribed in many books of chemiſtry, that I believe are almoſt in every body's hands.

The other means is by a diſtillation from any neutral containing this acid, by the addition of a ſtrong vitriolic acid. This gives a very volatile acid, which by its volatility may be applied to ſeveral purpoſes; and by its being in a concentrated ſtate it may be, by a proper dilution, applied to every purpoſe of medicine that the fermented acid of vegetables is fit for.

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It is true that this diſtilled acid wants ſome ſubſtances which are joined with it in the vinegar prepared by fermentation; and Dr. Boerhaave inſinuates that ſome virtues may be derived from theſe. I have not however truly perceived them; but allow, that if there are any ſuch advantages to be deſired, they may be more certainly obtained by employing the vinegar concentrated by freezing.

After theſe remarks upon the different management of this acid, I proceed to conſider its virtues. It is certainly a refrigerant power, which we conclude both from experience and from its antiſeptic powers; and it has this advantage over the foſſil acids, that it can bé thrown in, in much larger quantity, and with more effect, as it enters into the compoſition of the animal fluid. It is grateful to the palate and ſtomach, and certainly ſtimulates the latter ſo far as to excite appetite. By the ſame ſtimulant power it acts upon the mucous excretories of the mouth and fauces; and at the ſame time it ſeems to act as an aſtringent on the blood-veſſels of theſe parts, and proves uſeful in the inflammatory affections of them. When it is carried in large quantity into the blood-veſſels, a portion of it paſſes off by the excretions, and proves manifeſtly diuretic. It is celebrated alſo for its diaphoretic and even ſudorific virtues; and theſe are commonly aſcribed to its power of diſſolving the fluids. But this, upon the general principles which will be explained hereafter,

after, we muſt deny; and if it ever has appeared to have this effect, we muſt impute it to its refrigerant powers in the ſtomach, and its gently ſtimulant powers in the whole ſyſtem, aſſiſted by a ſudorific regimen.

We have now mentioned moſt of the acids that are well known in the practice of phyſic; but I muſt own that there are many others which have been ſometimes employed, and may I believe deſerve to be inquired after, but I own that I find the facts too few to determine the matter clearly, and at leaſt that I am too little acquainted with theſe facts to be able to ſpeak poſitively on the ſubject.

Of the large liſt that might be mentioned, the only one that I am diſpoſed to take notice of is the

Acid of Borax.

This was the invention of the celebrated Homberg; and, as he imagined it to be poſſeſſed of ſtrongly ſedative powers, he gave it the name of the *Sedative Salt.* Upon ſuch an authority it was introduced into practice; and ſuch is the favour for a new medicine, and ſuch are the excuſes ſo readily found for its failure, that it ſoon came to be much employed in France: and Mr. Geoffroy having found a cheaper method of preparing it, the govern-

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ment ordered, at their expence, that it ſhould be furniſhed to all the medicine cheſts of the army and navy.

This certainly gave an eaſy opportunity of trying its virtues; but we have hardly ever had any favourable reports of theſe from France, or from any other country of Europe: and it appears that the practice with it has ceaſed every where; and long ago Monſ. de la Mettrie has, in diſparagement of our art, obſerved, " *Que le ſel ſedatif n'eſt pas auſſi ſedatif qu'autre foi.*" " That the ſedative ſalt is not as ſedative now as formerly." To all this I could add my own experience, which has ſhown me, that even in large doſes this ſalt has but ſlight if any effect on the human body.

NEUTRAL SALTS.

The next ſet of refrigerants I am to ſpeak of, are the neutral ſalts; and theſe, with acids, are certainly the refrigerant remedies we chiefly depend upon in practice. The refrigerant power ſeems to be in common to every neutral, ſo far as we have yet tried them, except thoſe neutrals compoſed of the muriatic acid and foſſil alkali, and perhaps ſome other acids which carry into the compoſition of neutrals ſome other matters of an acrid kind: but theſe are not well aſcertained; and we take it for granted that it is of the nature of a neutral ſalt, compoſed of an acid and alkali, with the exception mentioned, to give a refrigerant ſubſtance.

This power in theſe ſalts is a matter of common experience, and may be preſumed from their antizymic and antiſeptic powers; but in what proportion it is in the ſeveral ſpecies, is not exactly aſcertained, though Dr. Smith, in his experiments, has done ſomewhat to this purpoſe. In the Doctor's experiments it appears, that, except in common ſalt, ſome ſedative power in every one takes place. In theſe, indeed, compoſed of the foſſil alkali, ſome ſtimulant power appears upon their firſt application; but ſoon after this, their ſedative power becomes manifeſt by their deſtroying the irritability of the part. After all, however, I cannot apply theſe experiments ſo as to explain the reſpective powers of theſe ſalts as they appear in the practice of phyſic. It appears here, that all them which ſhow a ſedative power in Dr. Smith's experiments, when thrown into the ſtomach, produce a diſpoſition to ſweat. The prejudices of practitioners at preſent are in favour of the neutral formed of the native acid of vegetables with the fixed vegetable alkali; and while this is the moſt agreeable, I have no objection to its being the moſt commonly employed in practice: but I make theſe obſervations to ſhow country practitioners, that when they happen to be in want of lemon juice, they may employ any other acid except the muriatic to form neutrals that may anſwer the ſame intentions; and a very little chemiſtry will teach them every thing elſe that may be here neceſſary. In the time of our laſt wars upon the continent, our practitioners frequently employed the vitriolic acid, and which was indeed employed in making the original antiemetic draught of Riverius.

With regard to particular neutrals, I have a few obſervations only to make. I have ſaid juſt now, that the vitriolated tartar may be employed as a refrigerant; and as it is thereby diaphoretic, it is employed in the compoſition named after Dr. Dover.

The ſal mirabile is almoſt only employed as a purgative; but that it has refrigerant powers, appears from the inteſtines being left, after the operation of this purgative, in a lax and flatulent condition.

What is named the ſecret ſal-ammoniac is little employed in practice; but there is no doubt that it is nearly of the ſame nature with the common ammoniac.

Nitre has been commonly eſteemed as the moſt powerful refrigerant; and from Dr. Smith's experiments, as well as from thoſe of Mr. Alexander, it appears to be ſo. But as all refrigerants produce a determination to the ſurface of the body; ſo, before this operation, they prove directly ſtimulant to the ſtomach and alimentary canal: and in this way nitre is as remarkable as any other; and it is therefore, in large doſes, very often uneaſy and painful to the ſtomach. When it is therefore neceſſary to continue its operation as a ſudorific, it is at the ſame time neceſſary to give it in divided doſes, and at proper intervals.

I do not doubt but the practice of Dr. Brockleſby may be often ſucceſsful; but I could never find it convenient to imitate it, as I could hardly, or at leaſt ſeldom, find a ſtomach that would bear half the quantity of nitre that he ſeems to have employed; and in moſt caſes I have been limited in the doſes of nitre that I could exhibit. I believe that the employment of nitre, as recently diſſolved, will be a more powerful refrigerant * than when the ſolution of it is entirely finiſhed; but I am of opinion that the practice has no advantages to compenſate the inconvenience that ſometimes attends its exhibition.

I have ſo ſeldom employed the cubic nitre that I know little of its qualities and powers.

Of the peculiar power of neutral ſalts formed of the muriatic acid, I have had occaſion already to remark, that by Dr. Smith's experiments, common

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* Dr. Percival made many accurate obſervations on nitre, and he found it to increaſe the force of the circulation, and hence he excluded it from the claſs of refrigerants Given, however, in the way recommended, it may act like *Ice*, a very powerful and common remedy in Italy, and perhaps iced water might be very uſefully employed in this country.

ſalt compoſed of the muriatic acid and foſſil alkali is the neutral which, applied to the nerves or other irritable parts, ſhows a ſtrongly ſtimulant power, and is therefore to be thrown out of our liſt of refrigerants. Its ſtimulant power ſeems in part to be owing to the foſſil alkali in its compoſition; for this alkali, joined with the nitrous or vegetable acids, do alſo, in the firſt application to the nerves, in Dr. Smith's experiments, ſhow ſomewhat of a ſtimulant power, which however ſoon paſſes away, and they afterwards prove manifeſtly ſedative. Theſe neutrals, therefore, conſiſting of the fixed vegetable or volatile alkali, though formed by the muriatic acid, may be taken into our liſt of refrigerants; and their common employment as ſudorifics, which they generally produce, is only to be explained upon this ground.

The uſe of the common ammoniac has been otherwiſe frequent in practice; but what are its peculiarly uſeful powers, I dare not determine. Its reſolving powers, by attenuating or diſſolving the fluids, I do not admit of; but that, like other ſaline matters, in paſſing by the excretions, they are ſuited to promote theſe, may be really allowed.

The neutrals compoſed of vegetable acids muſt be different according to the ſpecies of this acid employed: but they are all in general refrigerant and diaphoretic, and we know them only in that light. The one moſt frequently employed is that compoſed ed of the native acid and the fixed vegetable alkali, commonly known under the name of the Saline Mixture. The acid commonly employed is the juice of lemons; but that only becauſe a quantity of acid juice is moſt eaſily obtained from that fruit. I have frequently employed the expreſſed juice from ſeveral other fruits, which the country practitioner ſhould know in the caſe of the want of lemons; and I have frequently employed the juice of apples with equal advantage.

It is hardly neceſſary to ſay that the alkaline ſalt of wormwood, ſo frequently employed before, be now uſed, as the purer the alkali the medicine is the better.

This neutral ſalt, formed and given in due quantity, is, for what I can perceive, equally refrigerant and ſudorific as any other, and has this particular advantage, that it is, or can be, eaſily rendered more agreeable than any other. In my opinion it is commonly given in too ſmall doſes, and at too great intervals; and though given in large doſes, it is not ready, to give uneaſineſs to the ſtomach. When given in quantity, its diuretic and purgative qualities appear as in the other neutrals.

It has been of late a favourite practice to give the ſaline mixture during the act of effervеſcence; and beſides the advantages of introducing a quantity of aerial acid, I am perſuaded that the detachment

ment of that acid in the ſtomach renders the whole of the mixture more refrigerant.

The neutral ſalts as purgatives have been conſidered before. They operate upon the inteſtines, producing an eaſy, ſudden, and copious diſcharge, is equally explainable upon our principle. For the water, after having performed its ſtrengthening and exhilarating office upon the ſtomach, paſſes quickly into the inteſtines as fluids do, carrying along with it more or leſs of all its ingredients, but particularly its purgative. When there, the purgative, by its great dilution and conſequent diſperſion all over the internal ſurface of the canal, vellicates the innumerable little exhalent veſſels, with which that cavity is crowded, into a plentiful ſecretion: and notwithſtanding the ſtimulus may be but ſlight on any particular part, on account of the minuteneſs of the particles of the ſalt, yet as they are univerſally diffuſed, and act upon the whole ſyſtem of exhalents at once, a more copious and expeditious evacuation is produced, than what is often attainable from a much larger quantity of any of the other more ſtimulating purgatives leſs attenuated; attended at the ſame time with theſe important advantages; that as the ſtimulus is gentle, no griping pain is likely to be excited; and as it is ſuperficial, the particles muſt ſoon be waſhed off in the general current, without leaving behind them any of thoſe diſagreeable feelings that uſually hang in the rear of other cathartics.

That the Cheltenham purgative owes its great ſuperiority in the particular circumſtances I have here deſcribed, chiefly to the principle of attenuation, will appear ſtill more evidently from comparing it with other purgatives of that claſs: as we find that according to the quantity of water they retain in their cryſtallization, and their conſequent degree of ſolubility, the nearer and more remote in general is their reſemblance to it in their mode of operation.

Authors ſeem to differ widely in their accounts of the quantity of water contained in the different purgative ſalts, and alſo concerning their different degrees of ſolubility; owing probably to a variety of little circumſtances that affect their experiments at the time they are made. Such as the condition of the ſalt, and of its original conſtituent parts, the ſtate of the atmoſphere, the degree of heat, the quantity, if any, of the other contents ſeparated along with the water, in the evaporation; the temperature and purity of the water uſed in the ſolution, with other particulars not eaſy to be attended to or accurately aſcertained. But on comparing the different accounts, the following arrangement may, in a great meaſure, be depended on.

Firſt, the Cheltenham ſalt may be placed at the head of all the uſual purgatives of that claſs; its cryſtals being found to contain conſiderably above ſixty parts out of an hundred, of pure water; and to be ſoluble in about an equal weight of that fluid. Next to the Cheltenham, may ſtand the pure Glauber ſalt; as the water in its cryſtals is found to amount to more than fifty out of the hundred; and to be ſoluble in a little more than double their weight. Next the Glauber, may rank the Epſom ſalt; its cryſtals containing ſomewhat under fifty of water. As to the ſolubility, it is ſaid by ſome authors, that its cryſtals are more ſuſceptible of ſolution than the Glauber ſalt, notwithſtanding they contain leſs water in their compoſition. When ſo, the variation may be owing to a ſmall commixture of other ingredients beſides the magneſia earth and the vitriolic acid of which they are compoſed, as is not unuſual in the native ſalts, conjoined with the feeble attraction that is known to ſubſiſt between its original conſtituent parts. After the Epſom comes the ſea ſalt, but at great diſtance; as it is found to contain of water in its cryſtals, but ſixteen parts out of the hundred; and requires above three times its weight for ſolution. Laſtly, at the bottom of the ſcale, may be placed the vitriolated tartar; its cryſtals containing but ſix out of the hundred, and not being ſoluble in leſs than ſixteen times their weight of water. As to the other artificial purgatives compoſed of the different acids united with the different alkalies; ſuch as ſoluble tartar, diuretic ſalt, Rochelle ſalt, and the digeſtive ſalt of Sylvius; their places in the above ſcale, vary according to the various circumſtances of their preparation.

Now we find by experience, that the operation of theſe different ſalts, when compared with that of the Cheltenham ſalt, generally accords with the place in which they ſtand in the above arrangement. For example, if we take the ſecond in the ſcale, the *Glauber ſalt*, and compare its mode of operation with that of the laſt, the *vitriolated tartar*, we find it approaches much nearer to the Cheltenham ſalt in all the recommendable circumſtances before enumerated; notwithſtanding it differs from the other, only in its having the foſſil alkali, inſtead of the vegetable, united with the vitriolic acid in its compoſition. But as its cryſtals contain a much greater proportion of water, and are much more ſuſceptible of ſolution, its operation as a cathartic is gentle and expeditious, while that of the vitriolated tartar is rough and ſluggiſh.

Upon the whole then, we may conclude, that the principle will extend to the ſaline purgatives univerſally, and may be applied as the criterion by which we may judge beforehand concerning their different modes of operation; their action being merely mechanical, and all the varieties of their operation to be accounted for from their different degrees of ſtimulus upon the fibres of the living ſubject.

Could any principles be found out that would apply to the vegetable and animal kingdoms, ſo as to explain in the ſame mechanical manner the effects of their operation; ſuch a diſcovery would be of the utmoſt importance, as it would lay open the whole material world at once to the intelligent phyſician. He might then be truly ſtyled the *miniſter naturæ*, as all her ſtores would be ſubject to his direction; and from that inexhauſtible magazine he would be able to ſelect on all occaſions what was beſt adapted to his purpoſe, and to determine with preciſion what operation and what effects were to be expected in general from every medicine he adminiſtered.

But thoſe curiouſly organized productions of nature are ſo very complicated in their conſtruction, and the ingredients of which they are compoſed are ſo numerous, and ſo intimately and inextricably blended together, and at the ſame time acquire ſo many new properties from the manner of their arrangement, which on the ſlighteſt efforts to ſeparate them are totally loſt, that no juſt analyſis of them has ever yet been made, or is ever to be expected; and without that, their mode of operation upon the living ſubject muſt ever remain in obſcurity. Neither can the medicinal ſtore be very copious while it continues to derive its ſupply from mere accident, and the reſult of vague undirected experiment.

Whereas in the foſſil kingdom in general, the compoſitions are comparatively ſimple, and the ingredients few and permanent. Their ſtructure can therefore be eaſily unfolded, and their parts ſubjected to the various methods of examination without undergoing any conſiderable change by the proceſs. We are conſequently capable of obtaining an abſolute command over that claſs of bodies; ſo as to be able not only to de-compoſe them, but to re-compoſe and reſtore many of the moſt uſeful among them to their original forms, as by the hand of nature, according to our occaſions. From thence we are enabled to acquire a competent knowledge of their properties, both in their ſeparate and their aggregate ſtate, and to aſcertain and regulate their different modes of action, in all caſes whatever.

In order to illuſtrate the diſtinction between thoſe different claſſes of natural bodies, we need not go beyond the preſent ſubject of evacuation for an example.

The operation of the ſaline purgatives has been ſhewn to proceed from mere mechanical ſtimulus upon the ſenſible parts of the living body. But by what mode of action jalap operates as a cathartic, or ipecacuanha as an emetic, no ſatisfactory account has been given. Much leſs is any to be attempted for that extraordinary ſympathy which confines the operation of each principally to its reſpective organ, whatever may be the channel by which it is introduced into the conſtitution. How for inſtance an infuſion of jalap when injected by a vein into the courſe of the circulation, and conſequently conveyed to every individual ſpot of the body, affects no one particular part till it is ſecreted and diſcharged into the alimentary canal; and that there its operation ſhould commence, acting ultimately as a cathartic. Or how an infuſion of ipecacuanha, when injected in the ſame manner, ſuſpends its action till it arrives at the ſame place, and when there ſhould operate invariably as an emetic.

Theſe wonderful facts ſeem totally inexplicable: and yet they are eſtabliſhed upon the firm baſis of experiment, as will appear from the following account communicated to me by my late friend Mr. John Hunter, whoſe ſingular talents for inveſtigation have thrown a light upon the phyſiology of animals, and indeed of moſt parts of organiſed nature, that has ſhone through all Europe. The experiments were theſe.

He infuſed one ſcruple of jalap root in two ounces of water, and let it ſtand in infuſion for about two hours. He then injected one half of the clear liquor into the crural vein of a dog. In leſs than a minute the dog puked a little, and then ſeemed to be quite well. Thinking therefore there would be no farther effect from that injection, he threw in the remainder, but no more puking enſued. However, by degrees, the dog grew dull and feeble in his legs, ſo as to be induced to lie down. After lying a little time he got up again, and in about a couple of hours after the laſt injection, he had a motion downwards; the firſt part of which was of the uſual conſiſtence; but the remainder was looſe; and in about two hours more he had a very looſe purging ſtool. He then gradually recovered, and ſeemed to continue pretty much as uſual.

He in like manner infuſed one ſcruple of ipecacuanha root in two ounces of water, and then injected about one half into the ſame vein of a dog. The infuſion was no ſooner injected than the dog grew very ſick, and before his mouth was untied he began to vomit; and the moment after, he threw up every thing that was in his ſtomach, and continued ſick, ſo as not to be diſpoſed to eat for above a day afterwards.

Theſe experiments clearly demonſtrate our total ignorance of that claſs of bodies, their qualities and mode of operation; and that we muſt be indebted for our medicinal knowledge and application of them to accident alone.

Of the combination of acids with metallic ſubſtances, they are generally acrid and ſtimulant; and there are none of them that can be conſidered as ſedative or refrigerant excepting the ſal plumbi,

or

or ſaccharum ſaturni: of which I ſhall ſpeak hereafter.

The following formulæ may be directed.

℞ Kali ppti. ſcr. 1.
Suc. limon recent. unc. ½.
Aq. diſtil. dr. 10.
Syr. tolut. dr. 1.
Kali acetat. gr. 8, vel
Kali tartariſat. ſcr. 1, vel
Kali vitriolat. ſcr. 1, vel
Natron tartariſat. ſcr. 1½, vel
Natron vitriolat. ſcr. 2.
Spermacet. v. o. ſ. ſcr. 1.
F. Hauſtus, 4ta quaque horâ ſumend.

That is, take of

Prepared kali—a ſcruple.
Freſh lemon juice—half an ounce.
Diſtilled water—ten drachms.
Syrup of tolu—one drachm.
Acetated kali—eight grains, or in lieu of it
Tartarized kali—one ſcruple, or
Vitriolated kali—one ſcruple, or
Tartarized natron—a ſcruple and a half, or
Vitriolated natron—two ſcruples.
Spermaceti diſſolved in the white of an egg—one ſcruple.
To form a draught, to be taken every four hours.

THE

AVOIDING OF STIMULI,

BOTH

DIRECT AND INDIRECT.

Hh 4

PRACTICAL OBSERVATIONS.

SECT. LXXXVI.

REGIMEN.

In the former volumes, we have ſhewn what were the ſtimuli, both direct and indirect, and we are here to call that knowledge into practice.

The purity of the air is not in the ſthenic claſs of diſeaſes to be an object of conſideration; on the contrary, from facts before the public, it appears that great advantage might be derived from the employment of a reduced atmoſphere, or one containing leſs oxygen, or even of ſome of the mephitic airs, as the hydrogen, hydrocarbonate, and fixed airs. But great caution is required in the exhibition of ſuch active agents, unleſs it be in a ſtate of the higheſt dilution.

We ſelect the following as a very promiſing omen of ſucceſs in caſes of the ſthenic diſeaſe.

Dr. Thornton, phyſician to the Mary-le-bone General Diſpenſary, and lecturer on Medical Botany at Guy's Hoſpital, writes the following account to Dr. Beddoes.

September 26, 1796.
Duke Street, Groſvenor Square.

SIR,

MRS. LEWELLIN, ætat. 25, lives at Camden Town; ſhe was brought to bed of her firſt child laſt July, and, having very ſore nipples, ſhe attempted, after a few days, to wean the babe, and for thirteen weeks kept it from the breaſt; during which time the milk was conſtantly produced in the greateſt abundance, ſo that it run through every thing that was placed to receive it; notwithſtanding nipple glaſſes, and that the milk was frequently drawn off by means of a glaſs pipe, by an obliging neighbour. Inflammation gradually enſued, and it occupied the inferior half of both breaſts, and, extending down to the umbilical region, was terminated by a diſtinct line. The babe was now applied to the breaſt, but would not take to it. The heat and pain became extreme. There were many knotty and hard tumours on both breaſts. Matter ouzed out from the ſurface. The pulſe was 110, full; perſpiration conſtant and profuſe; agony ſo great, that ſhe was deprived of ſleep; and the child not thriving, and continually crying in the night, increaſed the affliction. She had given up all hopes of recovery, or even outliving many days, when ſhe applied to me; and her caſe ſeemed to authorize a new practice. Appearing too weak for the lancet, this remedy was precluded. As to evacuations, the ſame reaſon weighed alſo againſt that plan. The ſpeedieſt benefit, however, might ariſe from *diſoxygenating* of the *blood*, and the caſe was urgent. I therefore filled a bell glaſs with atmoſpheric air, and burning two table ſpoonsful of æther in it, as it was ſuſpended over water, I rendered it chiefly azote, and inflammable air. She perſiſted in inhaling this for about five minutes, ſtanding up, until the pulſe was obliterated; the eyes became dim, and no longer repreſented the objects of viſion; the face was deadly pale: and ſwooning coming on, ſhe fell into the arms of a ſervant, and we placed her on a chair, and I opened the window to admit freſh air. In about ten minutes ſhe revived; ſhe fetched ſeveral deep ſighs, and appeared faint, and ſtill very languid. The pulſe was feeble, and only 98; and for the firſt time, ſhe ſaid, for ſome weeks, ſhe felt her breaſts cold and eaſy. I directed her, when ſhe got home, to apply cloths wrung in yeſt to the inflamed ſurface; and I ordered an electuary three times a day of ſulphur, and ſulphurated kali; and on the ſound part, around the inflammation, I directed half a dozen leeches to be applied; and to divert the current from the inflamed parts, I ordered a large burgundy pitch plaſter to be placed betwixt the ſhoulders, which however acted like a bliſter. On the third day, when I ſaw my patient, her ſpirits were revived; the vivid red colour was abated;

the tumours of the breaſts were ſoftened; and the milk could be drawn off without torture. Mrs. Lewellin inhaled the air as before, but with leſs ſedative effect; when I ordered four freſh leeches (for the others had died immediately ofter the operation), and the yeſt and electuary as before. On the fourth day there was no longer occaſion for leeches, or the yeſt fomentation. The electuary, and a reduced atmoſphere, were, however, continued; and in a week the cure was perfected; and the child was applied to the breaſt, and health and happineſs were reſtored to both.

I have the honour to be, &c.

R. J. THORNTON.

Colds have been very ſpeedily cured by the inhalation of a reduced air.

The excluſion of light is another eſſential circumſtance.

The next conſideration is heat. From attention to nurſes *, and perſons about the patient, the chamber in which the ſick man lies is too often allowed to have a large fire. Even all the things

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* Nurſes are to be conſidered as watchmen, and ſhould be well clad. There ſhould be always two, to make a proper relief. It is a great pity that ſo much money is expended to have wiſe doctors, and ſo little is given for good nurſing, when theſe are the actual agents of his will, and are always choſen from a claſs moſt prone to counteract him.

are cooked there, to avoid the trouble of going down ſtairs. And practitioners admit this, ſooner than offend the low talkative hirelings of the day, forgetful of the ſacred duty they owe to the patient. Whoever, when in bed, has had a fire lighted in his room, cannot have failed to notice the exceſſive inconvenience that this additional ſtimuli has created. Not contented with this, nurſes uſually heap on clothes, that the patient may not catch cold, and the curtain is ſlyly drawn, in order that the dying man may not ſee the uſe made of his wine, and other things provided for his uſe. Whoever will peruſe the work of Sydenham will find that his chief merit conſiſted in noticing the evil of too much heat, and he ſeldom would allow his patient even to lie in bed, and the room was conſtantly kept ventilated with cool air.

Conjointly with the firſt bleeding, the firſt vomiting and purging, with abſtinence and watery fluids, it muſt not be forgotten, ſays Dr. Brown, that particular regard is to be paid to temperature *: for, if cold always debilitates, and if that is its proper operation †, if it only ſeemingly acts otherwiſe, becauſe heat ſucceeding to its action, or alternating with it ‡, renders its effect ſtimulant, if cold alone is adequate to

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* See Par. CCLXXXII. of the Elements. Vol. II.

† See Par. CXVII.

‡ See XXXVII.

the cure of the ſmall pox [*], or prevents the violence of that diſeaſe, if it is the beſt remedy for catarrh [†], and, when heat is avoided, of the greateſt efficacy in every ſthenic diſeaſe; it is not to be doubted, but that it is of the greateſt benefit in diſeaſes of the higheſt ſthenic diatheſis.

Its operation in the ſmall-pox, and in other ſthenic diſeaſes, is not different, but altogether the ſame. Nay, in all the diſeaſes of this form, cold is productive of the higheſt good, eſpecially when the ſthenic diatheſis, as is the caſe in the diſeaſes that are our preſent ſubject, riſes to its greateſt height, and demands inſtant relief; becauſe, in that caſe, every moment's delay brings inſtant danger; though the remedies, which we have mentioned, are ſufficient for the ſolution of the diſeaſe, of which we have direct proof in practice; though that degree of cold, which would produce the effect, is neither always within our reach, nor can be properly applied by every perſon; and many perſons might not be diſpoſed to believe its effects ſo beneficial: yet we ſhould not deſiſt from the plan of cure here laid down [‡], but do our beſt for the patient, by taking off the blankets, and other clothes, by cooling the room, and, inſtead of laying him on a couch or bed, putting him into a chair. This indeed ſhould, for the moſt part,

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[*] See Par. CXXI.

[†] See Par. CCCCVII.

[‡] From CCCCLIV. to CCCCLXV.

be

as the cold bath, on another account; for the ſhortneſs of the time in which any one could poſſibly remain in intenſe cold, would oblige him immediately to return to a higher temperature, which would produce a greater excitement than he had been under before his expoſure, at leaſt too great an excitement *.

After the application of intenſe cold, the application of heat muſt be ſtudiouſly avoided, becauſe its operation, from the increaſe of the excitability by cold, becomes more effective. And the conſequence is the more to be dreaded, becauſe, at the ſame time, other ſtimuli are uſually applied.

Cold is then the beneficial temperature in the cure of the ſthenic diatheſis, but it muſt not be followed by any conſiderable degree of heat. The miſtake, therefore, in medical practice, of thinking cold hurtful in ſthenic diatheſis by a ſtimulant operation, ſhould be corrected: its uſe in the ſmall pox is not to be underſtood to ariſe ſo much from its mere debilitating degree, as from avoiding the ſtimulus of heat after its operation. When the ſame precaution is employed, cold either alone, or in conjunction with other debilitating powers, has lately been found the moſt effectual remedy for catarrh, or for *a cold*, as it is vulgarly called.

From which circumſtance, and becauſe a cap of freſh earth put upon the head, has been of ſervice in phrenitis; and becauſe that degree of cold,

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* See Par. XXVI.

which

which attends froſt and ſnow, when applied to the naked body, has removed a ſynocha accompanied with delirium *; and becauſe cold is ſo efficacious [illegible] a remedy [illegible]

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* Such a diſeaſe is called, ſays Brown, the common inflammatory fever, very improperly, as being no fever, but a general pyrexia, or affection of the whole ſyſtem, without inflammation or local affection. Its proper generic name is pyrexia. See Elements, par. LXVIII. where that appellation is aſſigned to it. Great miſchief has been occaſioned by vague terms. Thus when a perſon is ſaid to be affected with a diſeaſe; when it is aſked what diſeaſe it is, and the anſwer given, that it is a fever, immediately bleeding is thought of, though that, and every, evacuation is as hurtful in putrid fever as it may be ſerviceable in the pyrexia. There has nothing done greater injury to medicine than this bad claſſification of diſeaſes. In Ireland an apothecary coming to die, the widow taking a liking to the boy who curried his late maſter's horſe, married the boy, and he was immediately put into poſſeſſion of the *Edingburgh Pharmacopœia Pauperum,* and alphabetically arranged he found *fevers,* and the remedies good for them, *ſore eyes,* and the remedies for them, and ſo forth, and plucking out his remedies from a cabinet thus labelled and furniſhed, he became a famous doctor, for ſuch *as lived he cured,* and thoſe *who died, nature killed.* In all pyrexias, where the patient is uneaſy with the weight of clothes, have ſhook them off, and courageouſly expoſed themſelves to cold, and drank freely of cold water, inſtead of death recovery, contrary to the prognoſtic of the phyſician, has enſued. From which, and a prodigious number of facts to the ſame purpoſe, all concurring in the proof of the debilitating operation of cold, there can hardly ariſe a doubt in the mind, that in a certain high degree, if it could be conveniently uſed, or if there were occaſion to have recourſe to it for want

a remedy in the ſmall-pox; it clearly follows, that the uſe of cold ſhould be extended to the whole range of prediſpoſition and the whole circle of diſeaſes, depending upon ſthenic diatheſis.

The effect, therefore, falſely imputed to cold, of occaſioning the ſtriking in of the meaſles, is not to be imputed to cold alone, but to heat and other ſtimuli; giving, as has been explained, more excitement *, than if cold had not preceded. And how can it be otherwiſe? If cold does not interrupt the eruption in the ſmall-pox; but, on the contrary, by an enlargement of the diameters of the perſpiratory veſſels, which are ſhut up by ſthenic diatheſis, much promotes the diſcharge of the matter †: why, in a perfectly ſimilar caſe, ſhould its operation be ſup-

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want of efficacious remedies, it would at once remove the higheſt degree of ſthenic ſtate that ever occurs in diſeaſe, and reduce the excitement from the neareſt approach to 70 down to 40. Nay it might run into the oppoſite extreme and go all the way to death. But we ſhall, by and by, have occaſion to obſerve, that we are ſo well provided with effectual remedies as not to be under any temptation of ſtraining this to its height. And we ſhall alſo find that a number of remedies in a moderate degree are preferable to any one, or to a ſmaller number in a higher degree. The diſcovery of the principle upon which the cure of ſthenic diſeaſes turns, has enabled us to render the cure both more complete and exact, than it could have been without principle.

* See XXVII. and the addition, and CCCLXXX.

† See CCCLXXVI.

poſed

poſed different, not to ſay, diametrically oppoſite? Muſt we again have the trouble to refute the falſe notion that *a cauſe preciſely the ſame may produce contrary effects?* Cold diminiſhes the eruption in the ſmall-pox: it makes the eruption diſappear in the meaſles. What then? Take a nearer view of the fact: is its effect in both theſe caſes to be ſuppoſed the ſame, or different? How do you know, that the matter, which has diſappeared, is driven into the interior parts? What proof will you bring? Confeſs the truth: and be candid enough to acknowledge, that this is another relic of the alexipharmic doctrine, according to which, the ſtimulus of heat as well as other ſtimuli promotes, and cold impedes perſpiration. After a great man had ſhown the error of that doctrine, both in the ſmall-pox and other diſeaſes *, becauſe he did not carry the application ſo far as the meaſles, neither has any one of his followers, who never could ſtep a nail's breadth beyond his words. But it might have been obſerved, if obſervation had been any part of their employment, that the meaſles was a ſthenic diſeaſe as well as the ſmall-pox. Are not all the ſucceſsful remedies in both of the debilitating kind? And as it was manifeſt, that in the ſmall-pox alſo cold debilitated, or, in the common language, acted as a ſedative; might not ſome ſuſpicion, from that very circumſtance, have ariſen in their minds, that cold, in the meaſles, does not ſtimulate, or act as an aſtringent, and repel the eruption, but produces the ſame effect as in the ſmall-pox? Is it, to ſuch a degree, up-hill work, to uſe one's own underſtanding, that a great part of mankind, even thoſe who take upon them the buſineſs of teaching and taking the lead of others, in no caſe ever thinking of exercising a moment's reflection?——But, it may be contended, that the action of cold is in this caſe peculiar, becauſe, after the eruption, which it is ſuppoſed to check, has diſappeared, all the ſymptoms increaſe in violence. Conſider what that circumſtance makes for your argument, or whether it makes any thing for you, and not abſolutely againſt you? Was the action of cold followed by that of ſtimulant or debilitating powers? If it was by the former, the cauſe of the miſchief muſt be imputed to them; which, as has been juſt ſaid, produce exceſſive excitement after a previous application of cold, and more than without it; if debilitating powers had been applied, then there would be room for ſuſpicion, that cold had a concern in the effect. But it is not ſo: and, in every caſe, in which the action of cold has been followed by ſthenic diatheſis, the true cauſe was not ſufficiently guarding againſt the ſtimulus of heat, as well as that of other noxious powers. This is clearly proved by the application

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* In peripneumony he took his patients out of bed, and ſet them in a chair, for the ſake of cooling them, and avoiding the hurtful effect of heat.

of

of heat being poſitively ordered, inſtead of being forbidden, in the common practice. Nor is that to be wondered at: for if the cauſe of catarrh * deceived phyſicians ſo much, the catarrhal ſymptoms in the meaſles could not fail to deceive them. And, if doctrines, diſcarded in words, are often obſerved in practice; what was there to hinder this part of the alexipharmic doctrine from meeting with this fate?

If cold, therefore, can ſcarce be ſo managed, that the effect occaſioned by the accompaniment, the ſucceſſion, or the alternation, of ſtimulants, can be prevented, whether that be the fault of the phyſician, or owing to the nature of the thing †; it is, notwithſtanding, a rule in common to the meaſles and other diſeaſes of the ſame ſtamp, to avoid heat, and compenſate for the degree by the greater duration of cold, and to guard with all poſſible care againſt every ſtimulant power. It is now then moſt evident, that the opinion of cold being peculiarly hurtful in the meaſles, both in that and every other diſeaſe of the ſame form, falls to the ground ‡.

Dr. Brown, in confirmation of this doctrine, gives us a very remarkable caſe of a perſon labour-

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* See from CCCCVII. to CCCCXII.

† Turn back to CCCCLXV. and CCCCLXVI.

‡ Brown.

ing under fever, who living in the old town of Edinburgh, eſcaped the vigilance of his nurſe; flew naked out of the houſe in a very keen froſt with ſnow upon the ground, acroſs the ſtreets, paſſed over into the new town, and from that to the fields beyond it. He ſoon became ſenſible of his ſtate, ſtole into a houſe next to him, got ſome clothes thrown about him, and was carried home in a chair, perfectly cured of his diſeaſe. From which, and a prodigious number of facts to the ſame purpoſe, all concurring in the proof of the debilitating operation of cold, there can hardly ariſe a doubt in the mind, that in a certain high degree, if it could be conveniently uſed, or if there were occaſion to have recourſe to it for want of efficacious remedies, it would at once remove the higheſt degree of ſthenic ſtate that ever occurs in diſeaſe, and reduce the excitement from the neareſt approach to 70 down to 40. Nay it might run into the oppoſite extreme and go all the way to death. But we ſhall by and by have occaſion to obſerve, that we are ſo well provided with effectual remedies as not to be under any temptation of ſtraining this to its height. And we ſhall alſo find that a number of remedies in a moderate degree are preferable to any one, or to a ſmaller number in a higher degree. The diſcovery of the principle upon which the cure of ſthenic diſeaſes turns, has enabled us to render the cure both more complete and exact, than it could have been without principle.

Every exertion of the mind and body ſhould be prohibited. No good news, on any account, ſhould be ſuffered to be related. With regard to terror, on telling the patient he will not recover, it is dangerous. But the mind, nevertheleſs, ought to be kept in ſome ſuſpenſe.

In order to facilitate the operation of all theſe various means of allaying intenſeneſs of motion in the vaſcular ſyſtem, we are to keep the patients on ſuch a courſe of diet as ſhall be perfectly light, and not at all irritating.

In moſt of the ſpecies of ſthenic diſeaſes there is, a loſs of appetite, which is an eſſential ſymptom; it is therefore a ſuperfluous caution to ſay, that in theſe caſes we are not to allow the patients ſolid fleſh-meat or broths, becauſe they naturally nauſeate, and refuſe ſuch food, and the things that people chiefly reliſh at theſe times are thoſe which are moſt proper, namely, ſubacid and watery drinks, or at moſt thin gruels, or panada acidulated.

In Ireland, the patients, in all febrile diſeaſes, generally uſe a kind of drink which ſeems almoſt peculiar to this country, and which is extremely grateful, and well adapted to cool and quench thirſt; it is whey, made of ſour butter-milk and new milk, boiled up together; hence called Two-milk Whey.

In the commencement of inflammatory diſeaſes, and while the pulſe continues full and ſtrong, this is the drink which is moſt in uſe, and it appears to anſwer remarkably well; but in places where this two-milk whey cannot be procured, almond-milk, barley-water, ſage-tea, decoction of the roots of couch-graſs; hot water poured on currant jelly, or on ſliced apples, and lemonade, are in their turns to be given to the ſick perſon; and if there be any appetite for ſomewhat more ſubſtantial, barley or oaten-gruel, panada, roaſted apples, currant jelly, or ſuch light nouriſhment, is to be given, in ſuch quantities, and at ſuch intervals, as the patients ſhall deſire, and the particular circumſtances of the caſe may ſuggeſt.

But in ſome purely inflammatory caſes, there is ſometimes no great degree of ſickneſs, and the patients have a deſire for taking more ſolid food than is proper; but in ſuch caſes, it will be the buſineſs of thoſe who have the care of the ſick perſon to ſee that he does not touch ſolid fleſh-meat, or even broth, ſo long as the intenſeneſs of motion in the vaſcular ſyſtem ſhall continue ſo great as to give ſufficient reaſon to apprehend any danger.

We ſhould not only enjoin what is to eat, but the patient ſhould always be required to abſtain from every ſort of food but vegetable, as well as from all ſtrong liquors, and indeed, one might ſay, from all but watery liquors acidulated. This direction does not ſeem to have been ſo much neglected in words by former writers and authors, as in the actual application to practice; it having been delivered ſlightly, by the by, and as if it had been thought of no conſequence, ſo that it made no impreſſion upon the mind of the reader or hearer. No ſtimulus is more powerful, and, therefore, in this part of the practice, more hurtful, than that of the articles of diet: conſequently, whatever quantity of blood is taken from the veſſels, whatever quantity of ſerous fluid is carried off by the mouth and anus, if this ſtimulus is not effectually guarded againſt, the effect of all this evacuation may eaſily be counteracted by improper diet.

PRACTICAL OBSERVATIONS.

SECT. LXXXVII.

SWEATING.

THE terms ſudorific[*] and diaphoretic[†] are, for the moſt part, uſed indiſcriminately; for all thoſe things that are ſuppoſed to have the power of promoting and increaſing the cutaneous diſcharges: but, ſtrictly ſpeaking, ſudorifics mean ſuch things as raiſe plentiful ſweat, while diaphoretics do little more than increaſe the inſenſible perſpiration.

Neither ſudorifics nor diaphoretics are by any means ſo certain in their operation as emetics or cathartics; for, whereas we can almoſt certainly aſſure ourſelves, that vomiting or purging will enſue after taking any of the different medicines which have been already mentioned, yet we never can be certain that a ſweat will break out in conſequence of giving any of the things termed ſudorifics. From this great uncertainty concerning their operation, it happens that things of oppoſite ſenſible qualities ſhall occaſionally become ſudorifics; for, in order to raiſe a ſweat, the medicine muſt not only increaſe the circulating force of the fluids, but alſo have power to take off ſpaſmodic conſtriction. Hence all ſtimulating things that have power to irritate the heart and increaſe the blood's progreſſive motion will prove ſudorifics; if, at the ſame time, the cutaneous pores ſhall happen not to be preternaturally conſtricted; and, on the other hand, all very cooling and ſedative things, whoſe power conſiſts in cauſing an extraordinary relaxation of the cutaneous pores, may occaſionally raiſe a ſweat. Thus, drinking fermented liquors or whey, taking ſome of the volatile alkaline ſalts, or other acrid ſtimulants, will, at certain times, prove ſudorific; and thus, drinking of cold water, or taking a large doſe of nitre, will, at other times, excite the cutaneous diſcharge.

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[*] From ſudor, ſweat.

[†] From διαφερειν, to carry through.

From this we may eaſily infer how little dependence is to be had on the ſudorific virtues, which are aſcribed to a multitude of things by writers on the Materia Medica.

Since, in order to raiſe a ſweat, either the force of the circulating fluids muſt be ſo far increaſed as to overcome the reſiſtance in the extremities of the cutaneous arteries, or their orifices, which open on the ſurface of the body, muſt be ſo far relaxed, that their reſiſtance ſhall not be equal to the force exerted by the heart; the moſt certain way of promoting this diſcharge is, to apply ſuch things to the ſurface of the body as ſhall relax and ſet open the cutaneous pores. Nothing can do this more effectually than warm vapour: and therefore a ſtove or vapour-bath is the moſt certain way of raiſing a plentiful ſweat, which may be increaſed to a very high degree; if at the ſame time that the vapour is applied to relax the pores at the circumference of the vaſcular ſyſtem, ſome ſtimulating drink be plentifully adminiſtered to increaſe the power of the heart, and cauſe a greater force to be exerted from the center. I know not that this has ever been applied in thoracic inflammation.

The moſt powerful, as well as moſt certain internal ſudorifics, are combinations of antimonials, or of ipecacuanha, with opium; the latter is termed Dover's Powder, and is ſometimes uſed with ſucceſs in caſes of inveterate rheumatiſm.

℞ Pulv. Ipecac. comp. gr. 10.
Horâ ſomni ſumend.

That is, take of
The compound powder of Ipecacuan—
ten grains, going to bed.

Or, Antim. tart. gr. $\frac{1}{2}$.
Pulv. opiat. gr. 5.
M. F. pulv. horâ ſomni ſumend. ſuperbibend. ſeri lactis tepid. lb. $\frac{1}{2}$.

That is, take of
Tartarized antimony—half a grain.
Opium powder—five grains.
For a powder to be taken at bed time, drinking after it half a pint of milk whey, made with vinegar or wine.

Or the following:
Kali ppti. ſcr. 1.
Suc. limm. recent. unc. $\frac{1}{2}$.
Aq. ſont. unc. $2\frac{1}{2}$.
Syr. ſimp. dr. 2.
Tinct. opii, gt. 12.
Vin. antim. gt. 30.
F. Hauſtus h. ſ. ſumend.

That is, take of
Prepared kali—a ſcruple.
Lemon juice—half an ounce.
Water—two ounces and a half.
Simple ſyrup—two drachms.
Tincture of opium—twelve drops.
Antimonial wine—thirty drops.
Make into a draught to be taken at bed time.

Addere liceat tinct. ſcill. gt. 30.
Vel kali vitriolat. gr. 10.
F. Hauſtus ter in die repet.

It is proper ſometimes to add, when the lungs are oppreſſed, thirty drops of tincture of ſquills; or, to keep the body ſoluble, ten grains of vitriolated kali, and the draught thento be taken three times a day.

The uſe of diaphoretics in febrile diſeaſes muſt depend on ſuch a number of nice circumſtances that no general directions can be given; only this caution ſeems neceſſary, that ſo long as the ſpaſmodic conſtriction is found to continue, we are never to give any of thoſe things mentioned in the books under the titles of Diaphoretics, Febrifuges, or Alexipharmics; for all theſe, unleſs the conſtriction has already given way, will only add to the diſtreſs by augmenting the heat, and increaſing the diſturbance in the vaſcular ſyſtem. But when ſigns of this relaxation appear, then we may aſſiſt the power of the heart, by giving wine whey, or ſome of the pharmaceutical diaphoretics.

Dr. Brown was a great ſtickler for ſudorifics. He endeavoured to confute the objections againſt them thus. Some, ſays he, may ſay that the heat, which accompanies the firſt part of the operation of ſweating, may be hurtful; for, as he never made trial of it, he has it not in his power to ſay, that for certain it will be hurtful. This is readily admitted in an high diatheſis, threatening indirect debility; but it cannot alſo be granted, that in a moderate degree of the diatheſis, either original, or effected by other remedies, and, conſequently, after the plan of treatment, that we have laid down, has been executed, ſuch heat will not be compenſated by the great profuſion of fluids taken away from the whole ſurface of the body; or that, when this part of the vaſcular ſyſtem has been freed from a violent ſtimulus, the diminution of excitement will not be more equal in all the veſſels, and over the whole nervous ſyſtem. If the numerous veſſels, that open into the inteſtines and into the ſtomach, afford ſuch an opportunity to diminiſh ſthenic diatheſis, how is it poſſible that a ſimilar evacuation in the ſimilar perſpiratory veſſels ſhould have no tendency to produce the ſame effect? To which reaſoning if the facts juſt related be added, what can any perſon have to ſay againſt the uſe of ſweating, if a degree of heat, not greater than what cannot be avoided in the operation, can no longer be hurtful, and if the ſweating itſelf is certain to be of great ſervice *?

Let

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* In an excitement of ſixty-ſeven, within three degrees of indirect debility, the heat in the firſt part of the ſweat, by adding theſe, might kill the patient, if you will, without leaving any chance of relief from its evacuant effect. But, if

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Let the ſpaſmodic caviller againſt the uſe of that remedy in the caſes of ſthenic affection where it is admiſſible, muſter up all his facts and all his theories, let him turn himſelf into all ſhapes, he will never produce a ſolid argument againſt this remedy.—But what, again, is the tendency of all this diſputation? Will there never be an end of running from one extreme of error into the oppoſite? Shall no mean be found betwixt the alexipharmic plan of cure, and one equally bad or worſe? If that doctrine heſitated not to preſcribe ſweating in the rage of a peripneumony, and that too procured by means of the moſt heating ſtimulant powers; does it therefore follow, that a plan of treatment muſt be admitted, which rejects the certain and ſafe uſe of this remedy, when excited by the moſt gentle means *? If

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the excitement be no higher than 60°, the addition of the three degrees will keep greatly within the point of indirect debility, and, therefore, be ſafe; while the ſucceeding evacuation may reduce the excitement perhaps 10°, and bring it within the range of predisſpoſition; and a new courſe, or a little prolongation of this, carry it down to the point of health, and finiſh the cure.—*Brown.*

* Brown's practice was, when the ſigns of a ſpontaneous ſweat are perceived, nothing more is to be done, but firſt to lay the clothes about the patient, remove the ſheets, put the blankets next to his body, guard againſt the approach of air, and keep up the diſcharge for a ſufficient length of time, at leaſt ten or twelve hours. If from this management there ſhall enſue a copious and univerſal flow of ſweat, there will be

If it was the opinion of Dr. Sydenham, that heat ſhould be avoided in the cure of ſthenic diſeaſes, which was quite right, as heat certainly increaſes the excitement; are we, for that reaſon, to avoid that tolerable degree of heat, which accompanies a remedy the moſt powerful in reſtoring the healthy ſtate, and, thereby, deprive ourſelves of great benefit upon the whole? If ſuch perſons do not know, that ſeveral remedies diminiſh excitement more powerfully than one; and if they are to be excuſed for their ignorance; are they alſo to be excuſed for not ſeeing, what any empiric might have ſeen, that ſome things are of ſervice, and others of diſſervice; is ſuch want—not of genius, for genius is not required of them—but of common ſenſe alſo, to be pardoned? If to think for themſelves, and to make any ſort of diſcovery, was too much to be expected from them *; is it not ſomewhat ſurpriſing, that out of a thouſand writers, who have treated of every part of medicine, and entertained different ſenti-

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be no occaſion for giving medicine for the purpoſe.—After ſweating has increaſed the relief formerly procured; if it ſhould diſappear towards the end, it ſhould at laſt be ſupported by Dover's powder, or by laudanum alone; at the ſame time the body ſhould be covered, ſo that it may get as quickly as poſſible to the ſurface, till the expected benefit be obtained.

* The reader is referred to what is ſaid in Vol. III. page 108, when treating of catarrh, where we gave our reaſon for diſſenting from Dr. Brown.

ments from one another, they could ſqueeze no information, but always trod in the footſteps of one ſingle man * ?

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* Such are the expreſſions of Dr. Brown, who always ſhewed a hearty contempt for the faculty, who had ſo very illiberally oppoſed his doctrines!

PRACTICAL OBSERVATIONS.

SECT. LXXXVIII.

HOW THE REMEDIES SHOULD BE VARIED.

The error of phyſicians in general is that they have a great reliance on bleeding. It was to the honour of the great Dr. Brown firſt to notice this dangerous error, and I feel the more pleaſure, in ſtating his *practical* improvements in medicine, as they are ſo little underſtood even by thoſe who profeſs themſelves to be *Brunonians.*

As the noxious powers, that produce prediſpoſition to diſeaſes, or diſeaſes themſelves, act ſome on one part, ſome on another, with ſomewhat more force than on any other equal part; and as this part is commonly that to which they are directly applied *; ſo the powers, which are employed as remedies, in order that their general effect may reach the whole body with the more certainty, ſhould be, in the ſame manner, differently applied to different parts.

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* Vide Par. XLIX. of Brown's Elements.

The action of every exciting power, whether ſalutary or hurtful, or curative, always extends over the whole body, the whole ſeat of excitability, but ſtill with the inequality mentioned in the fourth chapter of part the firſt. This is the baſis of the diſtinction with reſpect to the preſent ſubject: which is, that, as every power acts moſt effectually on the part where its action is immediately exerted, it is better to truſt to a number, every one of which poſſeſſes that advantage, than rely on *any one remedy*, however powerful otherwiſe; as by that means, whatever be the indication, whether it be to increaſe or diminiſh excitement, the effect will be more equally produced over all in conſequence of there being a number of parts that have had a ſtrong action exerted upon them.

The cure, therefore, of any ſthenic diſeaſe whatever, is improperly entruſted to bleeding alone, though that is one of the moſt powerful of the debilitating remedies. The reaſon is, that, though the excitability is ſufficiently reduced by that remedy in the greater blood-veſſels, perhaps too much, yet in the extremities of theſe, as well as in the reſt of the body, it is not ſufficiently reduced. Nor is the alteration of bleeding with purging a perfect mode of cure*; becauſe, though the exceſſive excitement be ſufficiently, and more than ſufficiently, removed in the greater blood-veſſels, and in the innumerable ſmall arteries, whether exhalant or mucous, which diſcharge their fluid into the inteſtines; yet, neither on the perſpiratory terminations of the arteries, nor on the reſt of the body, is an equal debilitating energy exerted: the ſmall veſſels, for inſtance, which open into the ſtomach, are not ſufficiently relieved of their diſtending load, and therefore ſtimulating load, the ſtimulus in any veſſel being the quantity of its fluid. And although vomiting* ſhould be conjoined with the two remedies juſt mentioned, even this would not be enough to produce an equally diminiſhed excitement; as there would ſtill remain in the perſpiratory veſſels the ſame ſtate of excitement, as alſo in the reſt of the body, that is not vaſcular. In violent ſthenic diſeaſes, therefore, after diminiſhing the diatheſis, and in the ſlighter from the beginning of the diſeaſe, the addition of the operation of ſweating to the evacuations that have been ſpoken of, will produce a more equal diminution of excitement, and a more perfect ſolution of the diſeaſe. For by means of this evacuation, not only from the larger blood-veſſels, in the interior parts of the body, but from an infinity of outlets both of the external, and internal ſurface of the body, an immenſe quantity of fluids, every where diſtending, and, thereby, producing a very great ſum of excitement, is withdrawn. Nor is this all. For, ſince in ſlight ſthenic affections, the patient can take much nouriſhing food, and in them all, too much; the conſequence muſt be, that, however the quantity of blood and other fluids has been diminiſhed, if food, which is the only power that can produce blood, continues to be taken, all the veſſels, in proportion to the quantity that has been taken, will again go on to be filled, and to be fired with the fewel of exceſſive excitement. To prevent this inconvenience, and to diminiſh excitement, with ſtill greater equality over the ſyſtem; abſtinence, or a certain allowance of vegetable matter in a fluid form, and watery drink, will have a very great effect. Nor is this ſufficient. For if, after taking all the precautions and ſecurities that have been recommended, the degree of heat, that proves hurtful from its ſtimulus, be allowed to approach the external ſurface of the body; it will produce another inequality of excitement, however much it may have been properly and equally diminiſhed by the other means of cure. Wherefore, as the ſthenic diatheſis depends ſo much upon the ſtimulus of heat, directly affecting the ſkin *, and is, on that account, prevalent in the ſkin in preference

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* This was Sydenham's practice.

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* Bleeding ſhould come firſt, in the evening; then purging, the next morning; then vomiting; perhaps bleeding again, or more mild cathartics, or ſudorifics.

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* See Par. CXIII. of the Elements.

to other parts; to make ſure of rendering the diminution of excitement as equal as poſſible, the debilitating effect of cold ſhould be oppoſed to the high degree of excitement, which the heat has produced. When, at laſt, all the directions, which have been thus fully pointed out, have been executed, ſtill, to re-produce the equality of excitement, ſuited to good health; it remains, that we be on our guard againſt the ſtimuli that ariſe from the intellectual functions and paſſions. For, as they have great effect in producing ſthenic diatheſis *, ſo the prevention of them, muſt be equally effectual in removing that diatheſis, and in re-producing that equality of excitement, upon which health depends †.

If the cure of ſthenic diſeaſes hitherto has conſiſted in bleeding, purging, and in the uſe of refrigeration in a few caſes; and, if the other objects, which have now been ſo fully explained, have either been totally neglected, or mentioned in a ſlight way, by the by, and as if of no conſequence, and, in the treatment preſcribed in theſe caſes, not reduced to any principle; it will eaſily appear, from what has been ſaid above and in other parts of this work,

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* See Par. CXXXVIII. CXL.

† As the moſt healthy ſtate of man is occaſioned not by the operation of any *one*, or of *a few exciting powers*, but by the *united operation of them all*; ſo neither is its re-eſtabliſhment to be effected, but by the ſame united operation of all the remedies, the laſt of which come to be the ordinary means of the ſupport of the healthy ſtate.—*Brown.*

how much the knowledge of theſe diſeaſes has been *improved,* both in the practical and reaſoning part: and it will now, at laſt, be found a certain and eſtabliſhed fact, that both the nature and true theory of ſthenic diſeaſes, as well as the method of treatment, conſidered either as an art and imitative, or as rational and ſcientific, has been diſcovered and demonſtrated *.

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* This is taken verbatim from Brown's Elements of Medicine, being his eleventh chapter, and deſerves every attention of the practitioner.

SEDATIVE POISONS.

PRACTICAL OBSERVATIONS.

SECT. LXXXIX.

SEDATIVE POISONS.

IN conſidering ſedatives according to their effects, may they not be naturally divided into two kinds, viz. *Direct and Indirect?*

By a *Direct Sedative*, I mean a medicine which operates more or leſs immediately as a ſedative, without producing any ſtimulating effects; ſuch as the cicuta, hydrogen air, and perhaps many other ſubſtances.

By an *Indirect Sedative*, I mean a medicine which, although it ultimately produces ſedative effects, yet has ſome other previous ſtimulating operation; ſuch as opium, &c.

Now, although opium has generally been ranked as the chief of the ſedantia, yet its ſtimulating power is at preſent very well aſcertained: and every practitioner knows (what we have already mentioned), that, if applied to the eye, or to a tender ſurface, it will produce more or leſs of irritation and pain, whatever ultimate ſedative effects it may occaſion. From this ſtimulating property, which is always more or leſs diſcoverable on its firſt exhibition, are we prevented from employing it in caſes of ſtrong active inflammation? For, in them, if opium is given alone, the phlogiſtic diatheſis of the ſyſtem is in general thereby increaſed, and the diſeaſe thus rendered more difficult of cure.

But this is probably not the caſe with ſome other ſubſtances, the ſubject of our preſent conſideration, or if they are directly ſtimulant, and indirectly ſtimulant, that is, firſt produce a ſtimulant effect, this firſt ſtage is of ſo ſhort a duration, that they may well rank as *direct* ſedative powers, contrary to the ſentiments of ſome Brunonians.

The cicuta, if applied to the moſt irritable ſurface, or even injected into the cavity of the cheſt itſelf, produces no pain; on the contrary, it will immediately relieve it, ſhewing its direct ſedative power. No exhilaration is perceived; on the contrary, always a diſtreſs of the ſyſtem, and a diminution of both mental and bodily powers. If the head is affected, the images preſented to the imagination are frightful, vertigo and ſickneſs are produced, and often violent convulſions. Indeed the direct and quick ſedative effects of the claſs of poiſons we are conſidering have made them be eſteemed as narcotic, or ſtupifying; and the very terror of their name has hindered them from being employed, except in diſeaſes where all other means have failed. But let it be remembered, that the virtue of any drug is only relative, and that poiſons are either good or evil according as they are applied; for direct powers which are capable of ſuſpending all the actions of the body, even of the heart and brain itſelf, are ſurely capable of reſtraining inordinate action, and therefore, of being applicable to the large and dangerous claſs of ſthenic, or acute diſeaſes.

Our firſt conſideration will be that of the cicuta. There have already appeared three ſeparate publications from Dr. Stork of Vienna on this ſubject; but his caſes will help us very little in the preſent view of our ſubject. They at any rate ſhew, that theſe ſedative poiſons, blunting the ſenſibility of the nerves, mitigate the pain of excruciating ſores*, and

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* The formula is,

℞ Cicut. herb. exſiccat.
Chamœm. flor. ſing. unc. 1.
Aq. ſervent. lb. 1.
Coque per ſextam horæ partem, et liquori expreſſo, adde.

Farin. ſen. ſemin. q. ſ.
Ut fiat cataplaſma.

Parti dolenti calidum, et pauxillo olei olivæ illinitum, applicetur, et renovetur bis die.

That

and they may have done ſome ſervice in epilepſy and mania. But we are to conſider their uſe in ſthenic diſeaſes.

The following is one among the many cures performed in this way by Dr. Thornton.

Samuel Parker, coachman to Mr. Mills, Lincoln's Inn, was wet through driving his maſter, and the next day felt a violent pain in the right ſide, and could not fetch a breath without great pain, breathing extremely difficult, and cough ſevere; he was ſo ill, that every one deſpaired of his recovery. He was ordered an emetic, to be taken in ſuch ſmall quantity at a time, as to create conſiderable nauſea, and the following day he was to purſue the following directions.

℞ Suc. cicut. ſpiſ. gr. 3.
Pulv. trag. comp. dr. 2.
Simul terantur, et in portiones ſex equales dividantur; quarum ſumat

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That is, take of
The dry ſtalks of cicuta,
Chamomile flowers, of each an ounce.
Boiling water a pint.
Boil during ten minutes, and to the liquor, paſſed through a bag, add

The meal of linſeed,
As much as is ſufficient.

Apply this warm to the painful part, firſt ſpreading over it a little olive oil, and renew this twice a day.

unam primo mane, horâ xi. matutin. et horâ ſomni ſing. diebus.

That is, take of,

The inſpiſſated juice of hemlock—three grains,

Compound powder of tragacanth—two drachms.

Let them be rubbed together, and divided into ſix equal parts, of which let one be taken early in the morning, another at eleven in the morning, and at bed time every day.—Or,

℞ Suc. cicut. ſpiſſat. dr. 1.

Herb. cicut. exſiccat. in pulv. trit. q. ſ.

F. pil. 30, quarum cap. duo, dein plures, aucto illarum pro re nata numero, ſing. dieb.

That is, take of,

The inſpiſſated juice of hemlock—one drachm.

The dried powder of cicuta—as much as is ſufficient.

Make into thirty pills, of which take every day two, afterwards more, increaſing their quantity, as the occaſion may require.

In other cures of peripneumony, a pill of the powder of digitalis, of which one grain has been given night and morning, and the cicuta at eleven and ſeven in the day.

As other narcotic poiſons may be found hereafter to merit attention, we will conclude with ſome formulæ, which ſhould be very cautiouſly tried.

℞ Suc. ſpiſſat. aconit. gr. 1.
Glycyrh. pulv. gr. 2.
Conſ. cynoſb. q. ſ.
F. pilula, bis terve in dies ſumend.

That is, take of
The inſpiſſated juice of aconite—one grain.
Liquorice powder—two grains.
Conſerve of hips—as much as is ſufficient.
To make into a pill, to be taken twice or thrice a day.

℞ Belladon. folior. exſiccat. dr. ½.
Aq. ſervent. unc. 12.
Macera per quadrant. part. hor. in vaſe operto, et liquorem cola; et cap. coch. larg. duo ter in die.

That is, take of
The dried leaves of belladonna—half a drachm.
Boiling water—twelve ounces.

Digeſt in a covered veſſel for a quarter of an hour, and then ſtrain off the liquor. Take two large table ſpoonsful three times a day.

Theſe have already been employed as medicines; we will proceed now to another poiſon, the doſe of which I am unable to aſcertain.

Since Dr. Madden communicated to the Royal Society an account of the deadly effects of the ſimple diſtilled water from the lauro-ceraſus, many experiments have been made, here in England, to prove and confirm the truth of the ſame; but I don't know of any attempts that have been made towards diſcovering what influence this water, or the leaves from whence it is diſtilled, would have on animal bodies, if exhibited in *ſmall doſes*, and continued ſo for ſome time. Now as this, in my humble opinion, is the only way of inveſtigating the uſeful properties of ſuch plants whoſe modus of action we are unacquainted with, I hope the following experiments will be acceptable; for let them be ever ſo ſimple, they may lead us to greater diſcoveries, and without doubt one of the moſt conſiderable ſervices we can do to mankind, is to be diligent in making a variety of experiments, and collecting obſervations; and when we have procured a number of theſe, it will be allowable to reaſon upon, and deduce proper inferences from them.

To find out the virtues of plants, ſays Dr. Langriſh, has ever been reckoned the moſt commendable undertaking, and nothing is more certain than that the likelieſt means to diſcover the efficacy of ſuch as are not as yet uſed in phyſic, is to have recourſe to proper experiments with them upon brutes; for though ſome things may be hurtful to man, that are not ſo to other animals, and vice verſa, yet as the greateſt number of medicines affect both equally, the exhibition of them to brutes will afford good opportunities for obſerving their effects. Doubtleſs, ſays the illuſtrious Boyle, we trample upon many things that, did we know their uſes, might ſerve the nobleſt ends. We deſpiſe many common plants of extraordinary efficacy for want of taking pains to diſcover their virtues; and though ſome may be deleterious or poiſonous in themſelves, or in large doſes, yet it is probable that art may diſcover ways and means to reduce ſuch drugs into uſeful medicines.

I am of opinion we have ſimples of our own growth, capable of curing the moſt formidable diſeaſes, did we but underſtand their efficacy, and the beſt manner of applying them; and I doubt not but a further acquaintance with experimental philoſophy will hereafter ſuggeſt ways and means of diſcovering their virtues, and of making moſt noble medicines from ſuch plants which are little thought of at preſent, at leaſt, for ſuch uſes. I therefore, with all humility, beg leave to offer the following

ing experiments to the conſideration of the learned.

EXPERIMENT I.

To an old caſt-off horſe, blind, and troubled with the poll-evil, I gave a pint (wine meaſure) of laurel-water in the morning faſting, he having been tied up to an empty rack, all night, for that purpoſe.

Juſt before I gave it him, I took ſeven ounces, a drachm, and a ſcruple of blood from the jugular vein, which was extremely viſcid and foul, looking at firſt like coarſe greaſe, and after it had ſtood ſome time, it had *a coat upon it above an inch thick, tough and horny, rather reſembling one part of brawn than buff-leather*. The gore was of a deep black. The ſerum was pellucid, but no more in quantity than ſix drachms.

The pulſe, before he took the laurel-water *, beat 34 ſtrokes in a minute, and indeed they were not ſo much accelerated by the doſe as I expected, they never exceeding 45 that day. The only viſible effect was ſtopping the humour that flowed from his poll; which, though it ran in an extraordinary manner before he took the laurel-water, was quite ſuppreſſed in the evening. About two hours after he had taken his doſe, I gave him ſome oats, which he eat greedily, and continued perfectly well all night.

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* It was prepared as follows. Having procured a peck of freſh laurel leaves, ſays Dr. Langriſh, I weighed them very exactly, leſt I might be deceived by different meaſures in future trials; and accordingly I found their weight to be two pound one ounce and a half avoirdupois. To theſe I put three gallons of ſpring water, and diſtilled off, in a common alembic, two quarts, which were mixed together.

The next morning I let ſeven ounces and a drachm of blood, which, after it had ſtood twenty-four hours, as the other did, ſeparated an ounce and two ſcruples of clear, ſtraw-coloured ſerum. The craſſamentum was ſomething improved in its colour, and *the horny coat at the top of it was not quite ¾ of an inch thick.*

The poll-evil was quite ſhut up all this day, and therefore that I might know how long it would remain ſo, I deſiſted from giving any more laurel-water for three days. The next morning the humour began to flow again, though not ſo much as before; but on the third day there ſeemed to be as great a diſcharge as ever.

EXPERIMENT II.

A fine, freſh, young horſe being ſeized with the glanders, was turned into a ſalt marſh, and neglected till the diſtemper arrived at its greateſt height, or what the farriers call the chine-glanders, which among them is deemed incurable.

The matter which was diſcharged from his noſe was very viſcid, yellow, and extremely offenſive. His blood was exceeding glutinous and foul, and had a *buff-coat upon it more than half an inch thick.* The coheſion of the craſſamentum was ſo ſtrong as to reſiſt the weight of a column of mercury, in a glaſs tube, with an obtuſe point about the ſize of a pea, 13½ inches high, before the point of the tube cut through. The bore of the tube was ⅓ inch diameter. Eight ounces of this blood, which was taken from the jugular vein, ſeparated, after ſtanding 24 hours, no more than two drachms ten grains of yellow ſerum.

July 28, 1734. I gave to this horſe ſix ounces of laurel-water, diluted with half a pint of ſpring-water, and repeated it every morning for eight days.

Auguſt 5. I increaſed the doſe to eight ounces, and continued it for eight days more.

The ſame day eight ounces of blood afforded one ounce two drachms of ſerum, not quite ſo yellow as before. *The buff coat was ⅜ inch thick.* The coheſion very little altered.

Aug. 13. The doſe was increaſed to twelve ounces, and repeated every morning for eight days.

The ſame day eight ounces of blood ſeparated one ounce and a half of good coloured ſerum. *The buff-*

coat was now not above $\frac{1}{4}$ inch thick, and gave way to the weight of ten inches of mercury.

Auguſt 21. The doſe was increaſed to a pint, wine meaſure, and given every morning for eight days, mixed with a quart of ſpring-water.

The ſame day eight ounces of blood ſeparated one ounce four $\frac{1}{2}$ drachms of dark coloured ſerum. There was *now very little or no appearance of a buff-coat*, only here and there a bluiſh ſpeck, or film. Its coheſion was equal to ſeven and a quarter inches of mercury.

Auguſt 29. Eight ounces of blood ſeparated one ounce ſix drachms of dark coloured ſerum. The gore had *not the leaſt film upon it*, and was now grown ſo tender, that a column of mercury four inches high cut through it.

During the whole time the horſe appeared very briſk and well, and his appetite continued good. But as to his diſtemper, the running at the noſe increaſed in quantity, but the matter was altered into a white, well digeſted pus, without any offenſive ſmell, as at firſt.

The quantity of laurel-water which was taken in the whole time, was 336 ounces, or 21 pints.

EXPERIMENT III.

The following experiments were made to ſhew that even out of the body the laurel-water has great power over the blood.

To ſix ounces of blood extracted from a young man violently afflicted with an inflammatory rheumatiſm, I put one ounce of laurel-water, which altered the craſſamentum, rendering it ſoft and tender, *without a ſpeck of ſize upon it.* The ſerum was of a light red, like burgundy wine, and, after ſtanding 24 hours, weighed exactly two ounces.

Six ounces more of the ſame blood, being ſaved in another porringer, by itſelf, appeared very foul and *ſizy*, with a *thick, tough buff-coat upon it.* The ſerum was of a bright yellow, and weighed two ounces, one drachm, and ten grains.

EXPERIMENT IV.

Sixteen ounces of blood being drawn from a woman on the third day of a pleuritic fever, I put one ounce of warm laurel-water into a baſon which received about one half of it. The next day I found the blood which was mixed with the laurel-water of a bright colour, the coagulum exceeding tender, the ſerum of a pale red, and in a ſmall quantity.

The other parcel of blood had a *buff-coat* upon it at leaſt $\frac{1}{3}$ inch thick; the glumous part looked very foul and black; the ſerum was of a ſtraw colour, and much more in quantity than what was in the other porringer. But this patient being in the

country,

country, I had not an opportunity of examining into the exact proportions.

EXPERIMENT V.

Half an ounce of laurel-water being mixed with three ounces of blood, as it ran from the arm of a child ten years old, and troubled with the St. Anthony's fire, it preſerved a beautiful colour, and let go one ounce three drachms of dark coloured ſerum.

Whereas three ounces, ſix drachms, and fifty grains of the ſame blood, in another cup, ſeparated one ounce, a drachm, and a ſcruple of ſtraw coloured ſerum. The fibrous part had a *coat* $\frac{1}{6}$ *of an inch thick*, exactly reſembling melted ſuet.

I could add a great many more experiments of this kind, but as they all exhibited the ſame phænomena it would be uſeleſs. I ſhall therefore only obſerve, that from theſe experiments it is evidently demonſtrated, that laurel-water has a power of making great alterations in the blood; but whether it performs theſe effects by altering the figuration or bulk of the component particles of the blood, or whether it only fixes the ſerous and fibrous parts together, in ſuch a manner as not to give the lighteſt corpuſcles an opportunity of aſcending to the top, and by that means prevents the formation of the buff-coat, ſo uſual in inflammatory caſes, I ſhall leave to the learned to determine, and ſhall only take notice, that as the ſerum is always altered into a burgundy colour, when laurel-water is mixed with the blood as it flows from the vein, and not at all when it is put to the ſerum only, it evidently follows, that the tinge is taken from the globular parts of the blood.

Thus have I, ſays Dr. Langriſh, barely but faithfully related the reſult of my experiments, and am inclined to think ſome further uſe might be made of them, ſince, from all the phænomena, it appears that laurel is capable of producing ſurpriſing effects in an animal machine.

By a ſeries of experiments, and a long experience of the good or bad qualities of any drug upon brutes, we may inveſtigate, in a great meaſure, its nature, and what effects it is likely to produce in human bodies; which to determine expreſsly *à priori*, ſeems inſuperable to our underſtanding.

Conſidering how ineffectual many of our common and known remedies are in ſome diſeaſes, I eſteem, with the noble Boyle, the diſcovering and divulging uſeful things in phyſic, and the recommending good remedies, among the moſt extenſive acts of charity, whereby a man becomes, really, more ſerviceable to the world than by building of an hoſpital. And as the beſt remedies are to be ſought after among the moſt active and pungent drugs, or ſuch as in large doſes, or without proper management, may be deemed poiſonous; it follows that whoever is ſo happy as to diſcover a method of converting ſuch things into ſafe and uſeful medicines, will greatly advance the art of medicine, and will be enabled thereby to cure ſuch diſeaſes, as others might think incurable.

The pleaſure, variety, and uſefulneſs, that attend theſe ſort of experimental inquiries have happily brought them into great credit and repute. We have a large and beautiful ſcene already opened to our view; and whoever endeavours to cultivate or enlarge it will be ſure to be recompenſed for his pains. One experiment oftentimes ſuggeſts other inquiries little thought of before, which together with the inferences and applications to be made, lead us inſenſibly on; and it not unfrequently happens, that even when we obtain not what we ſeek, we find ſomething as valuable: ſo fruitful is nature, that induſtrious reſearches will ſure to be rewarded with ample diſcoveries.

PRACTICAL OBSERVATIONS.

SECT. XC.

ON YEST.

Although perhaps *yeſt* may not with ſtrict propriety come under the head of ſedative *poiſons*, yet as being a new remedy lately introduced and ſucceſsfully employed in caſes of peripneumony, it may be proper here juſt to notice it.

Having, ſays Dr. Thornton, in a communication ſent to Dr. Beddoes, aſcertained that the ſthenic pulſe was ſunk by the operation of the fixed air, extricated in the warm ſtomach from yeſt, I conceived, that in violent inflammation it might ſometimes preclude the free uſe of the lancet, and a caſe happily occurred, at the cloſe of laſt winter, which ſeemed to authorize the trial.

Mr. Kennedy, a hair-dreſſer by trade, living at No. 86, in Tottenham-court Road, aged 35, of ſo nervous a frame that he could not ſhave his cuſtomers (his hand being ſubject to tremble), was attacked with the prevailing inflammatory diſeaſe of the laſt ſpring, which took off ſuch a number of perſons. He was ſeized with rigour and headach, ſucceeded by acute pains in the cheſt; his breathing became laborious, and towards night he had violent delirium. I was ſent for early in the morning, and I obſerved 1ſt, a tenſe and oppreſſed pulſe; 2d, great heat; 3d, great difficulty of breathing; 4th, acute pains in the right ſide; and 5th, total loſs of ſleep. I inſtantly called to mind Brown's ideas on catarrh. After a ſevere froſt, with ſnow on the ground, the weather became mild, and the *accumulated irritability* was by the heat called into action.—Had blood been taken from the arm, the blood partaking of the ſame *increaſed irritability* would have contracted ſtrongly, and we ſhould have had that cupped appearance, buff-coat, and hard coagulum, ſo expreſſive of inflammation.

From this theory the art of cure ſeemed to be to adjuſt the ſtimuli to the tone of the irritable fibre; and as the ordinary ſtimuli produced inordinate action, from the increaſed irritability of the fibre, it became neceſſary to reduce theſe as early as poſſible. I was convinced, from former experience, that the oppreſſed pulſe would have riſen under the finger, as the ſtimulus of the blood was withdrawn; but as this fluid is with difficulty regenerated in habits like that of my patient, and in *this* epidemic bleeding had, as I obſerved, precluded quick re-recovery, I reſolved to omit for the preſent the abſtraction of this ſtimulus. I ordered the fire to be put out; I removed the ſtimulus of light; I would allow no one to ſit in his room, or ſpeak to him: to take off the ſtimulus of food from the ſtomach I gave him an emetic of tartarized antimony; and to take away all ſtimulus from the inteſtinal canal, I ordered a cathartic of rhubarb quickened by vitriolated kali. During the operation of theſe, I applied a very large bliſter to the cheſt, the ſtimulus of which I conceived would do no harm under the operation of the cathartic, and might do good by deriving from the lungs, and afterwards by drawing off the ſerum of blood, which is a ſpecies of half bleeding. To ſupply oxygen without caloric, I ordered from ſix to ten lemons in the twenty-four hours, in tamarind drink. Not contented with this, I wiſhed the famiſhed ſyſtem to abſorb as much fixed air as poſſible (whoſe ſedative power on the heart and arteries you have ſufficiently proved), and he took therefore yeſt in his acidulated water, and was ordered frequently to plunge his arm in this fermenting ingredient. I directed two grains of calomel to be taken at bed-time, the acid drink to be frequently repeated with the yeſt, and I encouraged no hopes in my patient, and in the morning he was to take the cathartic before mentioned, to which was added half a grain of tartarized antimony. The next day I found the pulſe of my patient leſs oppreſſed conſiderably. I aſked him to attempt an inſpiration, but he could not bear it. The want of ſleep was now eaſily accounted for. The lungs being in part a voluntary organ, as ſtrong action of the reſpiratory muſcles was acute agony, the mind was kept conſtantly alert in preventing a too free reſpiration, hence perhaps the reaſon why the breathing was quick and laborious.—He had no return of delirium. I repeated the purges on the two following days. The pulſe became ſofter; the tongue looked leſs white; the thirſt was abated; the breathing relieved; he ſweated profuſely; and began now to covet ſome food. I now admitted the ſtimulus of light; I raiſed his hopes; and progreſſively adding different ſtimuli, I came to bark; and in leſs than a fortnight he was about on his buſineſs, and as well as ever.

PRACTICAL OBSERVATIONS.

SECT. XCI.

OF THE UTILITY OF POPULAR INSTRUCTIONS, WITH AN EXHORTATION TO PHYSICIANS.

HAVING now finiſhed with the general mode of treating caſes of ſthenic diſeaſe, we would exhort the patient to an early application to the medical practitioner, and to the practitioner an energetic practice ſuited to the occaſion.

The friends of the patient (eſpecially nurſes) may object to the violence of the meaſures adviſed, but the practitioner muſt be ſteady in his reſolution, convinced that he has a moſt ſacred duty to perform. It may be right for him to confeſs, that his meaſures may ſeem cruel, that medicine was not deſigned for us in health, but that it reſembles the operations of ſurgery, which are ever conſented to for the ſake of life; and that to complain of purging, vomiting, bleeding, and bliſtering, as hard treatment, is as ridiculous as a perſon in the water in the act of drowning, refuſing a rope, becauſe it is rough and dirty, or calling out, that the perſon who is ſaving him takes him by the hair, and hurts him. The danger is ſerious, and the imperious voice of duty forbids all mean compliances.

We would next exhort the patient not only to an early application to the medical practitioner, but alſo to make a good choice in his phyſician. For the diſeaſe he labours under admits of no parley; a miſtake here cannot be afterwards rectified, and muſt terminate in death, or a ſtate ten times worſe than death. Even lay-perſons educated in the principles of the ſcience (unleſs the neceſſity is great) ſhould be diſtruſted. Medicine is not a ſpeculative ſcience only; but alſo an active and practical art, the proper exerciſe of which can be attained only by long experience. This is allowed to be the caſe in all the other practical arts, and the education in them is conducted accordingly. Let us ſuppoſe of a young man deſigned to be a ſailor, that for the firſt years of his education he ſtudies mathematics, natural philoſophy, and navigation, but has never been at ſea; when he makes his appearance there, what muſt be his ſituation? He can talk of mechanical powers, of friction, of the nature of magnetical effluvia, of the theory of the winds, and, in ſhort, ſhew himſelf maſter of every branch of his profeſſion, ſo far as ſpeculation could carry him. But can he handle a rope? can he go aloft and furl the ſails? can he make an obſervation in a rolling ſea? can he do any one uſeful work aboard the ſhip, or direct the ſailors how to navigate her in a ſtorm? Who would truſt himſelf to the direction of ſuch a ſea commander?—The caſe is much the ſame with the lovers of our art, who have had what is called good inſtruction, and are well grounded in every branch of our profeſſion except the practice; in which they muſt be defective, if they have not for ſome years diligently attended the ſick. So I doubt whether even Sir Iſaac Newton would have ſupplanted the ſimple ſteerſman of a ſhip.

The knowledge acquired from this work, however, will enable him to know the merits of his phyſician, and make him readily acquieſce in his injunctions, and this is a matter of no ſmall importance. For the ſtate of our profeſſion is ſingular. A common artificer has no other way of rendering himſelf eminent in his trade, but by excelling in it. Of this, all mankind are judges. If he is a bad workman, no addreſs or qualifications of any other kind can avail him. No gentleman can hope to riſe in the profeſſion of the law, who does not poſſeſs the abilities of a lawyer. The proofs of his knowledge, ingenuity, and eloquence, are daily exhibited to the world, and their value is duly aſcertained. In ſhort, every man's merit, in his profeſſion, may be well known to the public;

and is in general ſuitably rewarded. But the caſe is not ſo here, and impoſing garb may make the flock miſtake the wolf for the lamb, and I would wiſh every one to be ſhepherds upon ſo trying an occaſion.

The objection then of laying medicine open to the world like other ſciences, from its tendency to multiply bad practitioners, and to leſſen the authority of the phyſician, is not well founded. It is not poſſible to confine the practice entirely to regular phyſicians. Caſes are continually occurring of people labouring under diſeaſes, who can have no acceſs to the aſſiſtance of the faculty. It would be barbarous to hinder thoſe from uſing ſuch remedies as appeared to them moſt likely to afford them relief; or to prohibit a friend or a byſtander from giving their aſſiſtance in ſuch a ſituation. In fact, as every perſon preſcribes occaſionally, the only queſtion is, whether they ſhould receive any aſſiſtance from art, or be left to act as their fancy may lead them. If, by withholding this aſſiſtance, every diſeaſe, where a phyſician was not conſulted, was to be left to nature alone, phyſicians would have a plauſible excuſe for keeping the world in ignorance; becauſe it might be alledged, that more diſeaſes would be cured by the efforts of unaſſiſted nature, than by the random management of people imperfectly inſtructed in medicine. But, in reality, this is never the caſe in diſeaſes of any conſequence. I ſhall give an example, in the general treatment of fevers among the lower claſs of people, when they are deprived of medical aſſiſtance.—The unhappy patients are generally confined to a cloſe room, where they breathe a hot and putrid air; every method is tried to raiſe a ſweat; they are loaded with bed-clothes; ſometimes they are made to drink ſpiced and ſtrong liquors; at other times large quantities of warm water gruel, although their ſtomach loathe it, and it occaſion flatulence, ſickneſs, and oppreſſion. If, in conſequence of great heat or delirium, they attempt to get out of bed, they are confined to it by force; nor are they ſuffered to change their bed or body-linen, till the fever is quite removed; by which means the air becoming more putrid, aggravates the ſymptoms, and makes the diſeaſe contagious.—In ſuch caſes, becauſe the patients have no phyſician, and take no medicine, the diſeaſe is ſaid to be left to nature. But this is a miſtake. If ſuch patients had been really left to nature, they would have been treated very differently. They would have been indulged in whatever was agreeable to them; they would have breathed cool and freſh air; they would not have been teaſed to eat or drink beyond what their appetite demanded; they would have been indulged with cold water or ſmall beer in what quantity they pleaſed; they would have been ſuffered to get out of bed and to enjoy the cold air, or to have had few bed-clothes, with liberty to throw out their limbs without control; their linen would have been changed daily, and every thing kept clean and ſweet about them. Similar inſtances might be produced from other diſeaſes. Patients are ſo far from being left to nature, when no phyſician is called, that they are commonly oppreſſed with a ſucceſſion of infallible cures recommended by quacks, or by their weak and officious friends.

Learned phyſicians, then, have nothing to fear from the intruſion of men of ſcience who have turned their attention to medicine. Such will be modeſt in proportion to their knowledge of the ſubject, and will be the readieſt to call for the aſſiſtance of a phyſician of experience and abilities, to reſpect his judgment, and to enforce his preſcriptions; while, at the ſame time, they may ſuggeſt what may be uſeful to the ableſt of the profeſſion.

If we conſider the ſituation of a young phyſician of genius, brought forward and ſupported in his profeſſion under the honourable patronage of thoſe who are judges of that genius; and that of another deſtitute of ſuch aſſiſtance, and compelled by neceſſity to attend to the prejudices, and to humour the caprices of the ignorant and impertinent intruders into his office; how pleaſant, how creditable is the one? how humiliating the other, to every man of ſpirit and ſenſibility?

I have thus endeavoured to ſhew that, by laying medicine open, and encouraging men of ſcience and abilities, who do not belong to the profeſſion, to ſtudy it, the intereſts of humanity would be promoted, the ſcience would be advanced, its dignity more effectually ſupported, and ſucceſs more certainly ſecured to each phyſician, in proportion to his real merit.

Before I conclude, I cannot help obſerving, that ſuch objections as are made againſt any perſon pretending to judge of medical ſubjects, who has not been regularly bred to the profeſſion, were formerly urged againſt the reformers from popery. Beſides the divine authority claimed by the church, it was ſaid, that a ſet of men, who devoted their whole time and ſtudies to ſo deep and complicated a ſubject as theology, were the only proper judges of whatever belonged to it; that calling their authority in queſtion, was hurting the cauſe of religion, and lowering the ſacerdotal character. Yet experience has ſhewn, that ſince the laity have aſſerted their right of inquiry into theſe ſubjects, theology, conſidered as a ſcience, has been improved; the real intereſts of religion have been promoted; and the clergy have become a more learned, a more uſeful, and even a more reſpectable body of men, than they ever were in the days of their greateſt power and ſplendour.

APPENDIX

TO

CLASS THE FIRST.

PRACTICAL OBSERVATIONS.

SECT. XCII.

THE RHEUMATIC GOUT.

I WILL endeavour to diſtinguiſh a diſeaſe about to be deſcribed, from that diſeaſe which is frequent in cold, and more uncommon in warm climates. It appears moſt frequently in autumn and ſpring, leſs frequently in winter when the cold is conſiderable and conſtant, and very ſeldom during the heat of ſummer. It may occur, however, at any ſeaſon, if viciſſitudes of heat and cold be for the time frequent.

The acute rheumatiſm generally ariſes from the application of cold to the body when any way unuſually warm; or when one part of the body is expoſed to cold while the other parts are kept warm; or, laſtly, when the application of the cold is long continued, as it is when wet or moiſt clothes are applied to any part of the body.

Theſe cauſes may affect perſons of all ages; but the rheumatiſm ſeldom appears in either very young or in elderly perſons, and moſt commonly occurs from the age of puberty to that of thirty-five years *.

Theſe cauſes may alſo affect perſons of any conſtitution; but they moſt commonly affect thoſe of a ſanguine temperament.

This diſeaſe is particularly diſtinguiſhed by pains affecting the joints, for the moſt part the joints alone, but ſometimes affecting alſo the muſcular parts. Very often the pains ſhoot along the courſe of the muſcles, from one joint to another, and are always much increaſed by the action of the muſcles belonging to the joint or joints affected.

The larger joints are moſt frequently affected; ſuch as the hip-joint, and knees of the lower, and the ſhoulders and elbows of the upper, extremities. The ankles and wriſts are alſo frequently affected; but the ſmaller joints, ſuch as thoſe of the toes or fingers, ſeldom ſuffer.

This diſeaſe, although ſometimes confined to one part of the body only, yet very often affects many parts of it; and then it comes on with a cold ſtage, which is immediately ſucceeded by the other ſymptoms of pyrexia, and particularly by a frequent, full,

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* There are ſome inſtances, however, of rheumatiſm extremely acute in old people.

and hard pulſe. Sometimes the pyrexia is formed before any pains are perceived: but more commonly pains are felt in particular parts, before any ſymptoms of pyrexia appear.

When no pyrexia is preſent, the pain is ſometimes confined to one joint only; but when any conſiderable pyrexia is preſent, although the pain may be chiefly in one joint, yet it ſeldom happens but that the pains affect ſeveral joints often at the very ſame time, but for the moſt part ſhifting their place, and, having abated in one joint, become more violent in another. They do not commonly remain long in the ſame joint, but frequently ſhift from one to another, and ſometimes return to joints formerly affected; and in this manner the diſeaſe often continues for a long time.

The pyrexia attending this diſeaſe has an exacerbation every evening, and is moſt conſiderable during the night, when the pains alſo become more violent; and it is at the ſame time that the pains ſhift their place from one joint to another. The pains ſeem to be alſo increaſed during the night, by the body being covered more cloſely, and kept warmer.

A joint, after having been for ſome time affected with pain, commonly becomes affected alſo with ſome redneſs and ſwelling, which is painful to the touch. It ſeldom happens, that a ſwelling coming on does not alleviate the pain of the joint; but the ſwelling does not always take off the pain entirely, nor ſecure the joint againſt a return of it.

This diſeaſe is commonly attended with ſome ſweating, which occurs early in the courſe of the diſeaſe; but it is ſeldom free or copious, and ſeldom either removes the pains or proves critical.

In the courſe of this diſeaſe the urine is high coloured, and in the beginning without ſediment; but as the diſeaſe advances, and the pyrexia has more conſiderable remiſſions, the urine depoſits a lateritious ſediment. This, however, does not prove entirely critical; for the diſeaſe often continues long after ſuch a ſediment has appeared in the urine.

When blood is drawn in this diſeaſe, it always exhibits the buff appearance.

The acute rheumatiſm, though it has ſo much of the nature of the other phlegmaſiæ, differs from all thoſe hitherto mentioned, in this, that it is not apt to terminate in ſuppuration. This almoſt never happens in rheumatiſm; but the diſeaſe ſometimes produces effuſions of a tranſparent gelatinous fluid into the ſheaths of the tendons. If we may be allowed to ſuppoſe that ſuch effuſions are frequent, it muſt alſo happen, that the effuſed fluid is commonly re-abſorbed; for it has ſeldom happened, and never indeed to my obſervation, that conſiderable or permanent tumours have been produced, or ſuch as required to be opened, ſo as to have the contained fluid evacuated. Such tumours, however, have occurred to others, and the opening made in them has produced ulcers difficult to heal. Vide Stork. Ann. Med. II.

With the circumſtances mentioned before when deſcribing it, the diſeaſe often continues for ſeveral weeks. It ſeldom, however, proves fatal; and it rarely happens that the pyrexia continues to be conſiderable for more than two or three weeks. While the pyrexia abates in its violence, if the pains of the joints continue, they are leſs violent, more limited in their place, being confined commonly to one or a few joints only, and are leſs ready to change their place.

When the pyrexia attending rheumatiſm has entirely ceaſed; when the ſwelling, and particularly the redneſs of the joints, are entirely gone; but when pains ſtill continue to affect certain joints, which remain ſtiff, which feel uneaſy upon motion, or upon changes of weather, the diſeaſe is named the Chronic Rhumatiſm, as it very often continues for a long time. As the chronic is commonly the ſequel of the acute rheumatiſm, I think it proper to treat of both alſo in this place.

The limits between the acute and chronic rheumatiſm are not always exactly marked.

When the pains are ſtill ready to ſhift their place; when they are eſpecially ſevere in the night-time; when, at the ſame time, they are attended with ſome degree of pyrexia, and with ſome ſwelling, and eſpecially with ſome redneſs of the joints; the diſeaſe is to be conſidered as ſtill partaking the nature of the acute rheumatiſm.

But, when there is no degree of pyrexia remaining; when the pained joints are without redneſs; when they are cold and ſtiff; when they cannot eaſily be made to ſweat; or when, while a free and warm ſweat is brought out on the reſt of the body, it is only clammy and cold on the pained joints; and when, eſpecially, the pains of theſe joints are increaſed by cold, and relieved by heat applied to them; the caſe is to be conſidered as that of a purely chronic rheumatiſm.

The chronic rheumatiſm may affect different joints; but is eſpecially ready to affect thoſe joints which are ſurrounded with many muſcles, and thoſe of which the muſcles are employed in the moſt conſtant and vigorous exertions. Such is the caſe of the vertebræ of the loins, the affection of which is named Lumbago; or that of the hip-joint, when the diſeaſe is named Iſchias, or Sciatica.

PRACTICAL OBSERVATIONS.

SECT. XCIII.

THE GOUT.

It is an inflammatory affection of ſome of the joints which eſpecially conſtitutes what we call a paroxyſm of the gout. This ſometimes comes on ſuddenly without any warning, but is generally preceded by ſeveral ſymptoms; ſuch as the ceaſing of a ſweating which the feet had been commonly affected with before; an unuſual coldneſs of the feet and legs; a frequent numbneſs, alternating with a ſenſe of pricking along the whole of the lower extremities; frequent cramps of the muſcles of the legs; and an unuſual turgeſcence of the veins.

While theſe ſymptoms take place in the lower extremities, the whole body is affected with ſome degree of torpor and languor, and the functions of the ſtomach in particular are more or leſs diſturbed. The appetite is diminiſhed, and flatulency, or other ſymptoms of indigeſtion, are felt. Theſe ſymptoms,

toms, and thoſe mentioned above, take place for ſeveral days, ſometimes for a week or two, before a paroxyſm comes on: but commonly, upon the day immediately preceding it, the appetite becomes greater than uſual.

The circumſtances of paroxyſms are the following. They come on moſt commonly in the ſpring, and ſooner or later according as the vernal heat ſucceeds ſooner or later to the winter's cold; and perhaps ſooner or later alſo according as the body may happen to be more or leſs expoſed to the viciſſitudes of heat and cold.

The attacks are ſometimes felt firſt in the evening, but more commonly about two or three o'clock in the morning. The paroxyſm begins with a pain affecting one foot, moſt commonly in the ball or firſt joint of the great toe, but ſometimes in other parts of the foot. With the coming on of this pain, there is commonly more or leſs of a cold ſhivering, which as the pain increaſes, gradually ceaſes, and is ſucceeded by a hot ſtage of pyrexia, which continues for the ſame time with the pain itſelf. From the firſt attack, the pain becomes by degrees more violent, and continues in this ſtate, with great reſtleſſneſs of the whole body, till next midnight, after which it gradually remits; and after it has continued for twenty-four hours from the commencement of the firſt attack, it commonly ceaſes very entirely, and, with the coming on of a gentle ſweat, allows the patient to fall aſleep. The patient, upon coming out of this ſleep in the morning, finds the pained part affected with ſome redneſs and ſwelling, which, after having continued for ſome days, gradually leſſens.

When a paroxyſm has thus come on, although the violent pain after twenty-four hours be conſiderably abated, the patient is not entirely relieved from it. For ſome days he has every evening a return of more conſiderable pain and pyrexia, which continues with more or leſs violence till morning. After continuing in this manner for ſeveral days, the diſeaſe ſometimes going entirely off, not to return till after a long interval.

When the diſeaſe, after having thus remained for ſome time in a joint, ceaſes very entirely, it generally leaves the perſon in very perfect health, enjoying greater eaſe and alacrity in the functions of both body and mind than he had for a long time before experienced.

At the beginning of the diſeaſe, the returns of it are ſometimes only once in three or four years: but, after ſome time, the intervals become ſhorter, and the attacks become annual; afterwards they come twice each year, and at length recur ſeveral times during the whole courſe of autumn, winter, and ſpring; and as it happens that, when the fits are frequent, the paroxyſms become alſo longer, ſo, in the advanced ſtate of the diſeaſe, the patient is hardly ever tolerably free from it, except perhaps for two or three months in ſummer.

The progreſs of the diſeaſe is alſo marked by the parts which it affects. At firſt, it commonly affects one foot only; afterwards every paroxyſm affects both feet, the one after the other; and, as the diſeaſe continues to recur, it not only affects both feet at once, but after having ceaſed in the foot which was ſecondly attacked, returns again into the foot firſt affected, and perhaps a ſecond time alſo into the other. Its changes of place are not only from one foot to the other, but alſo from the feet into other joints, eſpecially thoſe of the upper and lower extremities; ſo that there is hardly a joint of the body that is not, on one occaſion or other, affected. It ſometimes affects two different joints at the ſame time; but more commonly it is ſevere in a ſingle joint only, and paſſes ſucceſſively from one joint to another; ſo that the patient's affliction is often protracted for a long time.

When the diſeaſe has often returned, and the paroxyſms have become very frequent, the pains are commonly leſs violent than they were at firſt; but the patient is more affected with ſickneſs, and the other ſymptoms of the atonic gout, which ſhall be hereafter mentioned.

After the firſt paroxyſms of the diſeaſe, the joints which have been affected are entirely reſtored to their former ſuppleneſs and ſtrength: but after the diſeaſe has recurred very often, the joints affected do neither ſo ſuddenly nor ſo entirely recover their former ſtate, but continue weak and ſtiff; and theſe effects at length proceed to ſuch a degree, that the joints loſe their motion altogether.

In many perſons, but not in all, after the diſeaſe has frequently recurred, concretions of a chalky nature are formed upon the outſide of the joints, and for the moſt part immediately under the ſkin. The matter ſeems to be depoſited at firſt in a fluid form, but afterwards becomes dry and firm. In their dry ſtate, theſe concretions are a friable earthy ſubſtance, very entirely ſoluble in alkalies. After they have been formed, they contribute, with other circumſtances, to deſtroy the motion of the joint.

In moſt perſons who have laboured under the gout for many years, a nephritic affection comes on and diſcovers itſelf by all the ſymptoms which uſually attend calculous concretions in the kidneys, and which we ſhall have occaſion to deſcribe in another place. All that is neceſſary to be obſerved here is, that the nephritic affection alternates with paroxyſms of the gout, and that the two affections, the nephritic and the gouty, are hardly ever preſent at the ſame time. This alſo may be obſerved, that children of gouty or nephritic parents, commonly inherit one or other of theſe diſeaſes; but whichever may have been the principal diſeaſe of the parent, ſome of the children have the one, and ſome the other. In ſome of them, the nephritic affection occurs alone, without any gout ſupervening; and this happens to be frequently the caſe of the female offspring of gouty parents.

In the whole of the hiſtory already given, I have deſcribed the moſt common form of the diſeaſe; and which therefore, however diverſified in the manner I have ſaid, may be ſtill called the regular ſtate of the gout. Upon occaſion, however, the diſeaſe aſſumes different appearances *; but, as I ſuppoſe the diſeaſe to depend always upon a certain diatheſis or diſpoſition of the ſyſtem; ſo every appearance which we can perceive to depend upon that ſame diſpoſition, I ſtill conſider as a ſymptom and cauſe of the gout. The principal circumſtance in what we term the regular gout, is the inflammatory affection of the joints; and, whatever ſymptoms we can perceive to be connected with, or to depend upon, the diſpoſition which produces that inflammatory affection, but without its taking place, or being preſent at the ſame time, we name the irregular gout.

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* Theſe different appearances which the gout aſſumes, are extremely unlike the regular gout above deſcribed: the young practitioner ought therefore to pay peculiar attention to them, that when he obſerves them in patients, he may not think them ſymptoms of other diſeaſes, or even miſtake them for primary diſeaſes. Errors of this kind are frequently committed by ignorant practitioners, to their own diſcredit and the danger of their patient's life.

Of ſuch irregular gout there are three different ſtates, which I name the atonic, the retrocedent, and the miſplaced gout.

The atonic ſtate is when the gouty diatheſis prevails in the ſyſtem, but, from certain cauſes, does not produce the inflammatory affection of the joints. In this caſe, the morbid ſymptoms which appear are chiefly affections of the ſtomach; ſuch as loſs of appetite, indigeſtion, and its various circumſtances of ſickneſs, nauſea, vomiting, flatulency, acid eructations, and pains in the region of the ſtomach. Theſe ſymptoms are frequently accompanied with pains and cramps in ſeveral parts of the trunk, and the upper extremities of the body, which are relieved by the diſcharge of wind from the ſtomach. Together with theſe affections of the ſtomach, there commonly occurs a coſtiveneſs; but ſometimes a looſeneſs with colic pains. Theſe affections of the alimentary canal are often attended with all the ſymptoms of hypochondriaſis; as dejection of mind, a conſtant and anxious attention to the ſlighteſt feelings, an imaginary aggravation of theſe, and an apprehenſion of danger from them.

In the ſame atonic gout, the viſcera of the thorax alſo are ſometimes affected, and palpitations, faintings, and aſthma, happen.

In the head alſo occur, headachs, giddineſs, apoplectic and paralytic affections.

When the ſeveral ſymptoms now mentioned occur in habits having the marks of a gouty diſpoſition, this may be ſuſpected to have laid the foundation of them; and eſpecially when either, in ſuch habits, a manifeſt tendency to the inflammatory affection has formerly appeared; or when the ſymptoms mentioned are intermixed with, and are relieved by, ſome degree of the inflammatory gout. In ſuch caſes there can be no doubt of conſidering the whole as a ſtate of the gout.

PRACTICAL OBSERVATIONS.

SECT. XCIV.

NEPHRITIC COMPLAINTS.

THIS diſeaſe, like other internal inflammations, is always attended with pyrexia; and is eſpecially known from the region of the kidney being affected by pain, commonly obtuſe, ſometimes pungent. This pain is not increaſed by the motion of the trunk of the body, ſo much as a pain of the rheumatic kind affecting the ſame region. The pain of the nephritis may be often diſtinguiſhed by its ſhooting along the courſe of the ureter; and is frequently attended with a drawing up of the teſticle, and with a numbneſs of the limb on the ſide affected: although, indeed, theſe ſymptoms moſt commonly accompany the inflammation ariſing from a calculus in the kidney or ureter. The nephritis is almoſt conſtantly attended with frequent vomiting, and often with coſtiveneſs and colic pains. Uſually the ſtate of the urine is changed; it is moſt commonly of a deep red colour, is voided frequently, and in ſmall quantity at a time. In more violent caſes, the urine is ſometimes colourleſs.

The remote cauſes of this diſeaſe may be various; as, external contuſion; violent or long-continued riding; ſtrains of the muſcles of the back incumbent on the kidneys; various acrids in the courſe of the circulation conveyed to the kidneys; and perhaps ſome other internal cauſes not yet well known. The moſt frequent is that of calculous matter obſtructing the tubuli uriniferi, or calculi formed in the pelvis of the kidneys, and either ſticking there, or fallen into the ureter.

PRACTICAL OBSERVATIONS.

SECT. XCV.

OF CALCULI AND THEIR SOLUTION.

When the illuſtrious Scheele read, in 1776, to the Academy of Stockholm, his examination of the bezoar, or ſtone of the human bladder, no one then had an accurate idea of the nature of this concretion, though Margraaf had already obſerved, that it was not formed of an abſorbing earth, as was pretty generally believed before him, and as has been repeated ſo often ſince in many works on medicine. Scheele obſerves in the beginning of his diſſertation, that he examined ſeveral calculi, ſmooth, rough, or angular; that he found them poſſeſs the ſame nature and properties: it is therefore the hiſtory of the genus that he meant to give. His memoir is divided into ten ſections. To aſcertain properly the value of his labour, I muſt here make the reader follow him through ſome of his experiments.

I. Potaſh united to the carbonic acid does not diſſolve the urinary calculus, either hot or cold; but a perfectly cauſtic ley of the ſame alkali, without any trace of the carbonic acid, diſſolves it even cold. This ſolution is yellow, of a ſweetiſh taſte; it is precipitated by all the acids, even the carbonic; it does not render lime water turbid; it decompoſes and precipitates metallic ſolutions, thoſe of iron brown, of copper grey, of ſilver black, of zinc, mercury and lead, white: it exhales an odour of ammonia.

II. Lime water diſſolves the calculus by digeſtion; 200 parts almoſt are neceſſary to take up one; it then loſes its ſharp taſte; this ſolution is precipitated in part by acids.

Scheele concludes from numerous experiments, that the urinary calculus does not contain either ſulphuric acid or lime; but that it is compoſed of a *concrete acid*, oily, volatile, mixed with a little gelatinous matter.

He ſays he found a little of this acid in all urine, even in that of children. This liquor evaporated to $\frac{1}{112}$ of its weight (14 pounds reduced to two ounces) depoſits a ſubtle powder ſimilar to the calculus, which adheres to the veſſel, and which the cauſtic alkali diſſolves very eaſily. The depoſit from the urine of patients labouring under fevers exhibited the ſame nature; it is formed in cloſe veſſels as well as in thoſe that are open; it is rediſſolved

diſſolved by means of heat, and its precipitation is owing only to the cooling of the urine.

All urines thus contain phoſphat of lime, kept in ſolution by an exceſs of the phoſphoric acid; which is the reaſon that it reddens blue paper, and depoſits a white powder by means of ammonia. Urine gives of it $\frac{1}{576}$ of its weight. This precipitate diſſolved in the nitric acid is rendered turbid by the addition of the ſulphuric acid, which forms with it a ſulphat of lime; the ſupernatant liquor, when evaporated, leaves the phoſphoric acid after ſeparating the nitric acid by evaporation. The urine of diſeaſed perſons is more acid, and contains more phoſphat of lime, than that of healthy perſons.

It reſults from all theſe facts, ſays Scheele in concluding his diſſertation, that urine, independently of the ſubſtances already known, viz. the muriats of potaſh, ſoda, and ammonia, the phoſphat of ſoda and ammonia, and an oily extractive matter, contains a *concrete acid*, hitherto unknown, (which forms the urinary calculus), and phoſphat of lime.

The diſcovery of Scheele, communicated to the Academy of Stockholm, was confirmed by Bergman, who gave, under the title of a ſupplement, a memoir containing his own experiments on the ſtone of the human bladder, with which he was occupied at the ſame time as his pupil and friend; and it may be readily perceived what muſt be the weight of the aſſent of that celebrated man, who firſt introduced into the deſcription of chemical phenomena, and the reaſoning on them, the purity, preciſion, and method of the geometricians. In announcing that his experiments conducted him to the ſame concluſion, viz. that the urinary concretion was compoſed chiefly of a *particular acid*; he ſays he found ſome differences, which, though he aſcribes them to thoſe of ſubſtances which they had both examined, were, however, found in all thoſe which he treated.

Bergman, in mentioning that he made numberleſs experiments on the ſtone of the bladder, takes care to point out that they prove nothing more or any way different from what Scheele has ſaid in his excellent memoir. All reſearches, ſays he at the end of his ſupplement, for the purpoſe of diſcovering a remedy for this diſeaſe, ought to be founded on a perfect knowledge of the properties of the calculus. He obſerves that *alkalies* are the only truly active remedies, the efficacy of which has been acknowledged by medical experience, in concert with chemical reſearches. He concludes his note by announcing that he hoped to be able to determinate more accurately whether all calculi of the bladder were really of the ſame nature. But during the eight years which were added to his life after this epoch 1776 (he died in 1784) his occupations and deranged ſtate of health prevented him from completing this labour, as he wrote nothing more than what I have here made known.

My view, ſays Monſieur Fourcroy, in commencing my labours on this ſubject, was not only to eſtabliſh the facts announced by Scheele, but alſo to purſue much farther the examination of urinary calculi; and to add to it that of all the animal concretions I could procure. This plan will be found partly executed in the details I have publiſhed. 1. On the inteſtinal calculus of the horſe, which I found to be a triple ſalt, formed of two parts of phoſphat of magneſia, and one part of the phoſphat of ammonia. 2. On a renal calculus of the ſame animal, in which I diſcovered three parts of the carbonat of lime, and one part of the phoſphat of lime, without any matter analogous to that in the human calculus. 3. On a calculus of a cat, which gave me three parts of the carbonat of lime, and one part of the phoſphat of lime. 4. On the tartar of the teeth, which I found to be pure phoſphat of lime. 5. On the calculus of the human reins, the nature of which I determined to be perfectly ſimilar to that of the calculus of the bladder.

With regard to the human urinary calculus, I had examined a ſufficient number to be able to trace out the general characters which I thought it neceſſary to add to thoſe given by Scheele. Having indeed repreſented it, after this illuſtrious chemiſt, as a ſolid acid cryſtallized in laminæ, inſipid, giving a faint red tinge to blue colours, ſoluble in cauſtic alkalies and in the nitric acid, aſſuming with the latter a beautiful red colour, decompoſable by fire, yielding a great deal of the carbonic acid and little oil; the weakeſt of all the acids; containing lime and alkaline phoſphats only by accident. I add to theſe characters the following properties eſtabliſhed by the analyſis of a great number of varieties of theſe concretions: 1. Their ſolution in water reddens turnſole paper. 2. They give the pruſſic acid by diſtillation, and by the action of the nitric acid. 3. The calculus of the human bladder contains but little hydrogen, ſince it gives but little oil; and but little oxygen, ſince it furniſhes but a very ſmall proportion of the pruſſic and carbonic acids.

The experiments which I afterwards deſcribed on the four calculi carefully treated by different agents, may be taken, according to all the other experiments, which I did not think it neceſſary to deſcribe in the ſame manner, as an account of the properties of the urinary calculus conſidered as a genus; and I muſt indeed here obſerve, there are none of them which do not preſent reſults more or leſs ſimilar. Thus: 1. The augmentation of its weight in water, into which the calculus was entirely immerſed. 2. The earthy ſmell of marl which it diffuſes, when diluted as a powder in this liquid. 3. The little alteration it exhibits, and the imputreſcibility it preſerves during more than fifteen days under water at a temperature above 12 degrees (57° Fahr.). 4. Its almoſt perfect ſolubility in 2000 times its weight of water, when repeatedly treated in powder. 5. Its ſolubility in leſs than half that quantity of boiling water; its ſeparation only partial in lamellated cryſtals by cooling—the manner of obtaining it thus pure. 6. Its property of reddening turnſole paper, when after this purification it is rubbed on this paper with a little water. 7. Its ſolution in lime water, which by expoſure to the air ſoon depoſits both carbonat of lime and the lithic acid ſeparate from each other, proves that the atmoſpheric carbonic acid decompoſes the calcareous lithiat which was there formed. 8. Its almoſt total ſolubility (except $\frac{1}{12}$) in a ley of cauſtic potaſh, which often diſengages much ammonia. 9. Its precipitation of a golden yellow colour from this alkaline ſolution by the acetous acid, which ſeparates from it the lithic acid in ſmall white brilliant and almoſt pulverulent needles, and which furniſhes more than a half of the cryſtallized lithiat of potaſh. 10. This precipitation of the lithic acid from the alkaline ſolution by the acetous acid, given as a good proceſs for procuring this animal acid pure. 11. The ſolubility of the calculus ſometimes entire, ſometimes in powder, in the oxygenated muriatic acid, which at firſt afforded me the hope of a lithontriptic; but which being deſtroyed by other ſucceſſive experiments, preſented only a ſingular fact worthy of being further inveſtigated. 12. The action of the fire and diſtillation in a retort upon the calculus of the human bladder, uſing a quantity five times greater than that employed by Dr. Pearſon, and which gave me as products near a quarter of a ſublimated lamellated acid, ſtill analogous to the *lithic acid*; ſome drops only of water and thick oil, fixed, containing a little pruſſiat of ammonia; $\frac{1}{8}$ concrete carbonat of ammonia, a bulk of more than ſix kilogrammes of impregnated water, $\frac{2}{3}$ of which were carbonic acid; a coal weighing a little more than a quarter of the calculus, and which yielded only $\frac{1}{80}$ of its weight of aſhes, without any ſenſible trace of lime.

All theſe facts, which I was obliged to concentrate here in ſome manner in order to render them more ſtriking, ſerved to confirm the firſt reſults of Scheele and Bergman; and enabled me to add ſeveral obſervations which had eſcaped them. I had concluded with them that the human urinary calculus, whether that of the reins or that of the bladder, contained a matter different from all other animal ſubſtance, not found in any other humours of the human body, nor in any of thoſe of the bodies of the different animals now known; a weak *concrete acid*, almoſt inſoluble, the principal ſolvents of which were the cauſtic alkalies; that this *particular*

cular acid very little hydrogenated and oxygenated, but much charged with carbon and azot, was an immediate production of the reins and of the diureſis, or of the formation of urine; that it was ſometimes joined with ſome parts of the phoſphats of lime, of ſoda, and of ammonia, with a colouring animal matter; but that theſe different ſubſtances, foreign to the lithic acid, ſeemed to be only acceſſories, variable in their proportions, which might not have been found there at all, and which did not ſeem to conſtitute the particular eſſence of it.

I may add to this notice of my labours, which are already pretty old, that the experiments I have had occaſion to make for ten years paſt on this animal matter, either for ſome particular purpoſe or in the courſe of my annual lectures, by confirming me more and more in my former ideas, agreeing with thoſe of Scheele and Bergman, have only taught me that ſome human urinary calculi contain phoſphat of lime, inſoluble in water and in pure alkalies, and the alteration which the lithic acid experiences by the action of the nitric acid when boiled in the latter—an alteration during which there is diſengaged carbonic acid gas, azotic gas, and the pruſſic acid gas; ſo that the calculous matter appears to me really to change its nature during this action of the nitric acid. But all this ought not to change any thing of my opinions in regard to the particular character and *acid* properties of the peculiar matter of the human urinary calculus.

C. Fourcroy then aſks, whether the labours of Dr. Pearſon have given different reſults, and of ſuch a nature as ſhould induce the French chemiſts to give up their former ideas reſpecting the nature of the peculiar matter of the human urinary calculus; or whether his experiments are ſufficiently concluſive to induce them to admit its non-acidity, and conſider it as an oxyd? He inſiſts that Dr. Pearſon has not correctly comprehended the labours either of the Swediſh or French chemiſts; that he has improperly believed that they gave the name of lithic acid to the ſublimate of the calculus obtained by fire, whereas they gave it, either to the entire calculus as it comes from the reins or the bladder, when wholly formed of that ſubſtance, or, to this matter obtained by cooling a ſolution of it in water, or by precipitating it from an alkaline ſolution by the acetous acid; and that Dr. Pearſon's pretended oxyd is really Scheele's acid, at firſt called the bezoardic, and ſince, in the new nomenclature, the lithic acid.

As to the product of the numerous experiments which Dr. Pearſon tried on more than 300 human urinary calculi which Mr. Heaviſide's extenſive muſeum * furniſhed him, and which he compared with

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* This grand repoſitory of ſubjects relating to the human œconomy ariſing from the large fortune and induſtry of one man

with each other, I find, adds Fourcroy, no other difference between what he announces and what was announced by his predeceſſors, but the variety of the nature which theſe experiments ſhewed to him between theſe concretions—a variety which, however, always ſhews the greateſt proportion in the kind of matter called by him the uric oxyd. It is in this reſult that Dr. Pearſon deviates moſt from Scheele, who aſſerted that all the calculi of the human bladder reſembled each other and exhibited no difference. But it may be readily perceived, that this difference between our author and the chemiſts whom he ſeems to combat no way affects the intimate nature of the real calculous ſubſtance, and it is only on the latter that it is of importance to fix the opinions of philoſophers.

Dr. Pearſon has, however, the merit of diſcovering by exact chemical experiment, that the chalky concretions of gout are of the ſame compoſition as calculi of the reins or bladder.

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man is ever open, for the promotion of ſcience, to every lover of it, nor did the illuſtrious poſſeſſor, I will venture to ſay, a moment lament the 300 fragments obliged to be taken from ſo invaluable a collection. Every Friday during the winter ſeaſon cards of invitation are ſent round to gentlemen of reſpectability, and in this immenſe room are found all the neweſt publications, and the whole muſeum being illuminated, preſents the higheſt feaſt for the philoſopher, or lover of wiſdom.

PRACTICAL OBSERVATIONS.

SECT. XCVI.

THE SAME QUESTION PURSUED.

Books and tradition never fail to offer a multitude of medicines for diſeaſes that are frequent and incurable; many of theſe medicines are the ſuggeſtion of the moſt fantaſtic analogies *, and the greater part are incapable of even palliating for a moment the

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* There exiſts, probably, no human malady, not even the jaundice, conſumption, aſthma, or cancer excepted, for which ſo many whimſical and nugatory means of relief have been propoſed, as for the ſtone and gravel. Beſides an infinity of inefficacious ſimples, the whole ſeries of remedies, from the warm goat's blood of Alexander Trallianus, the pounded glaſs of Bericellus a Sancto Marco, the eſſence of pigeon's dung of Johannes Poppius, the quinta eſſentia urinæ humanæ of Fabri, down to the ſtercus humanum found in the firſt Pharmacopœia of the London College, at once afford a proof of the inefficacy of each particular medicine, and of the prevalence of a diſorder, which could enforce ſo much attention, and ſuggeſt ſo many extravagant projects. *Dr. Beddoes.*

the ſufferings of the patient; yet a liſt, at firſt ſight ſo unpromiſing, is not abſolutely without its uſe. *The phyſician, ſays Dr. Beddoes, ſtalks abroad with an air of greater dignity when he feels a full quiver at his ſhoulders, however blunt may be the arrows it contains; and it ſupplies a ſtaff, however feeble, on which the wearied ſpirits of the patient may reſt, and defers a little that ſeaſon of ſettled gloom when futurity has nothing farther to promiſe to hope.*

But from all the teſtimonies that have fallen under my obſervation, continues the juſtly celebrated and philanthropic Dr. Beddoes, I can collect that, during the former part of the preſent century, ſome approaches have been making towards a remedy, which, whatever may be its mode of operation, or preciſe degree of efficacy, is undoubtedly capable both of relieving pain, which renders the diſorder ſo formidable, and of ſuſpending the progreſs of the diſeaſe itſelf.

As early as the year 1721, Robinſon propoſed ſalt of tartar, among other things, as a ſolvent for the ſtone. In diſorders of the uropoetic organs, whether ariſing from concretions or not, Hoffman praiſes the efficacy of the hot alkaline ſprings of Germany, as well as the ſalt obtained from the waters of Carlſhab.

Mrs. Stephens having met by accident with a receipt for the ſtone, conſiſting of egg-ſhells dried in an oven and powdered, ſhe adminiſtered it to ſeveral perſons afflicted with that diſeaſe. Afterwards ſhe burnt the egg-ſhells, which became at firſt black, but being kept longer in the fire, turned to a grey colour, bordering on a perfect white. After ſome trials of theſe black and grey powders in the quantity of as much as would lie on a ſhilling, three times a day, it appeared to her that the powder was more efficacious in proportion as the egg-ſhells were more burnt. But finding that it often cauſed great coſtiveneſs, ſhe added a ſmall quantity of ſoap occaſionally, to each doſe, with a view to prevent this inconvenience. And thus ſhe continued giving the burnt egg-ſhells with a ſmall quantity of ſoap for ſeveral years, curing *gravelly complaints* thereby, and ſometimes *diſſolving ſtones in the bladder*. After twelve years, ſhe gave her powder in larger doſes to one Mr. Coxon, adding to it very frequently half an ounce of ſoap in decoction. He had the ſymptoms of a ſtone in his bladder, voided, while taking the remedy, many concave and convex ſcales, with ſome ſolid fragments of ſtone, grew at length perfectly well, and never after that had any return of his complaint. He died at the age of eighty. As this gentleman had received a more conſpicuous cure than any other perſon before him, Mrs. Stephens began to augment the quantity of the powder and the ſoap, and found them attended with proportionably greater ſucceſs.

In the year 1735, the Hon. Edward Carteret, Eſq. Poſt-Maſter General, began Mrs. Stephens's medicines, and received great benefit. This engaged the attention of the public, and more particularly of ſuch as were afflicted with the ſtone or gravel, ſo that the number of perſons that took her medicine increaſed every day.

In the year 1737, the cures performed were ſo many, and ſo well atteſted *, that the ſpeedy publication

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* Mr. Bolton having obtained a cure by Mrs. Stephens's medicine, wrote to Dr. Hartley as follows, from Newcaſtle upon Tyne.

Dear Sir,

A more particular and exact account of all that have taken Mrs. Stephens's medicines, when it comes out, muſt be a great and moſt convincing proof of the good effects of them, and prevail on the charitable part of this nation to put a helping hand towards ſo univerſal a good, and the unſpeakable benefit the poorer ſort may reap from it.

For my own part, I thank God I am ſo perfectly cured of the ſtone by taking them, that I never ſince have felt the leaſt ſymptom of pain from that diſtemper with which I had been ſore afflicted about two years before, and could not endure to ride on horſeback, which exerciſe I can now bear with pleaſure.

I took all the things before this that I could hear of in this country to make me eaſy, but without effect. I began the medicines in much pain, which, with ſome intermiſſion, continued for about a fortnight, and then it abated, and I was ſomewhat eaſy; but had more or leſs of pain, night and day, with ſome remiſſion indeed, during the time of taking the remedy. I did not hear of any that complained ſo much as I did; perhaps the ſtone might be of a harder nature than uſual, cation of them was judged to be of great importance to mankind: and accordingly, in the year 1738, a propoſal for raiſing 5000 l. by *voluntary* contributions, as a reward to Mrs. Stephens for diſcovering her

uſual, and might not diſſolve ſo kindly as in others; but by perſiſting in the medicines, the ſtone began to diſſolve and come away in bits, and I was then more eaſy.

Mr. Binford and Mr. Holland both took the medicines at the ſame time I did; they each came to ſhew me what came from them, and to compare with me. I obſerved that the operation was the very ſame with them, having juſt ſuch bits as I had, and at the laſt a larger hard ſtone, which appeared to be the kernel. They were ſo much alike that one would think they all came from the ſame perſon. The bits are perfect ſtone, only ſoft at coming away; but laid on a paper they ſoon dry to be perceived what they are. It is a ſurpriſing medicine, and would be of great uſe, and if known, a vaſt kindneſs to poor people, who are not able to give the price it now is. The manual operation is come to perfection; yet how muſt the poorer ſort come at it in the country, when they cry out for ſome aſſiſtance?

Since my recovery to health and ſtrength, ſome of the poor pit-men in pain and diſtreſs have been to inquire of me what I took. When I told them they complained lamentably of their affliction and poverty, not being able to pay the price of the medicines. Some are ſince dead. For while they ſtrive to labour under ſuch grievous pain, they periſh for want of relief, and it is hoped all good and well-diſpoſed Chriſtians, who have any charity or benevolence for mankind, will conſider and promote the noble deſign you have undertaken.

I have the honour to be, &c.

Mr. Underwood's caſe which he publiſhed is equally ſtriking.

Dr.

her medicines, was preſented before the public with her conſent *.

As this propoſal, however, did not meet with the expected ſucceſs, ſhe was adviſed, in the beginning of the year 1739, to apply to the *Houſe of Commons*

Dr. Hartley having himſelf commenced Mrs. Stephens's medicine, voided in conſequence many fragments of ſtone, and feeling leſs pain than before, and being better able to jumble over the pavement in London, he conceived a high opinion of the efficacy of Mrs. Stephens's remedy. He therefore collected and publiſhed 154 trials. Several of the caſes were drawn up by the perſons themſelves, or written from their accounts. "If," ſays he, "I have flattered myſelf with falſe hopes, it is eſpecially my intereſt to be undeceived, and my duty to acknowledge my error. But if, on the contrary, I have ſatisfactorily proved a diſſolving power in the medicated urine, Mrs. Stephens will appear to you (the College of Phyſicians) in a different light from the common *pretenders to noſtrums*, and you will not think the meaſures that have been taken by me to obtain the publication of her medicines, any encouragement of an *impoſtor*. Vide p. 53, par. 2.

* From April 1738 to February 1739, the ſubſcription was open, and near 1,400 l. was collected. Among the liſt of ſubſcribers we note, with pleaſure, the illuſtrious names of ſeveral eminent phyſicians.

Mrs. Stephens's propoſals were,

I. As ſoon as 5,000 l. are raiſed by voluntary ſubſcription, Mrs. Stephens ſhall diſcover her medicines, and they ſhall be made public.

II. That time ſufficient for the trial of her medicines ſhall be given, and ſhe ſhall receive the 5,000 l. contribution, if it *mons* for the above-mentioned reward, ſubmitting her medicines, when diſcovered, to ſuch examination as the Houſe ſhould think right, before the payment of the reward. This ſhe did, and a bill was brought in for the purpoſe, which paſſed both Houſes, and had the royal aſſent at the concluſion of the Seſſions, June 14, 1738. She next preſented a paper, containing her method of preparing and giving her medicines, to his Grace the Archbiſhop of Canterbury, June 16th following. Trials were made with the medicine thus diſcovered. They were found to produce the promiſed effects; the truſtees named in the Act of Parliament met March 5, 1740, gave Mrs. Stephens the certificate required by that act, and ſhe received the 5,000 l. reward at the Exchequer, March 17th following.

Extract from the Gazette, March 18, 1740.

1. Mr. Gardiner *, of Fetter-lane, aged 61, had the uſual ſymptoms of a ſtone in the bladder, with

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it ſhall appear to the Archbiſhop of Canterbury, the Duke of Richmond, the Earl of Pembroke, &c. that theſe medicines are able to diſſolve ſtones in the bladder;—but if this does not clearly appear, the principal ſhall be returned to the contributors.

Surely no propoſal could be more fair or honourable to one party. Dr. Hartley has emphatically marked in italics, among the liſt of ſubſcribers, the names of but *two biſhops* and *one ſurgeon!*

* Theſe were the ſelected perſons, on whom the medicines were tried, and who were examined by the Houſe on oath.

violent pains for ſeveral years. He was ſearched by Mr. Nourſe, ſurgeon, Dec. 30, 1738, when both he, and Mr. Wall, apothecary, felt a ſtone in the bladder. Mr. Gardiner took the medicines about eight months, voided many pieces of ſtone in that time, was freed from all his ſymptoms; and being ſearched again, firſt by Mr. Sharp, Sept. 14, 1739, and then on the 30th of November following by Mr. Nourſe, Mr. Cheſelden, Mr. Sainthill, and Mr. Belcher, ſurgeons, no ſtone could be found.

2. Peter Appleton, of Black-friars, aged 67, had the ſymptoms of a ſtone in the bladder for more than ſeven years, with exceſſive pains for the five laſt years of that time. He was ſearched July 6, 1739, by Mr. Sharp, and found to have a ſtone in the bladder, which ſtone was alſo felt by Dr. Pellet, Dr. Neſbit, Dr. Whitaker, and Dr. Hartley, and judged by all preſent to be a large one. He took the medicines for about five months, during which time he voided a very large quantity of ſtone in flakes and ſmall fragments. He grew quite free from all his complaints, and was ſearched again, firſt by Mr. Sharp, Nov. 9, and afterwards by thirteen phyſicians and ſurgeons; but no ſtone could they find.

3. Henry Norris, of Leather-lane, aged 55, had the ſymptoms of a ſtone in the bladder for about a year and a half. Auguſt 17, 1739, he was ſearched by ſeveral phyſicians and ſurgeons, who all felt

the ſtone. He took the medicines about four months, and voided only a thick ſediment in that time, however he was free from all his ſymptoms; and being ſearched again, Dec. 14, by eight phyſicians and ſurgeons—no ſtone could be found.

4. William Brighty, of Colcheſter, aged 79, had the ſymptoms of ſtone in the bladder for more than three years. He was ſearched Sept. 8, 1739, by Dr. Gardiner and Mr. Sharp, and found to have a ſtone. He took the medicines for about four months, voided many pieces of ſtone during that time, became free from all his ſymptoms; and being ſearched again by Dr. Gardiner, Mr. Sharp, and Mr. Belcher—no ſtone could be found.

Out of 154 caſes * publiſhed with a view to recommend Mrs. Stephens's remedy to the notice of the public, by the celebrated David Hartley, M. D. and which he addreſſed to the Preſident and Fellows of the Royal College of Phyſicians, I ſhall only extract the caſe of Dr. Kirkpatrick, an eminent practitioner of phyſic in Ireland. Perhaps it might be ſerviceable to mankind, if phyſicians, attentive to the progreſs of ſcience, and their own feelings, were, from time to time, to become martyrs to thoſe diſeaſes for which remedies are ſtill wanting, or are but newly introduced.

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* Vide note * p. 567.

Dr. Kirkpatrick's Caſe.

For theſe ſixteen years paſt I have been afflicted with the gravel in the kidneys, and after the uſual paroxyſms of vomiting, &c. the uſe of the warm bath, emollient clyſters, &c. have paſſed divers ſtones. The laſt of theſe ſevere fits was in July 1737; I then paſſed a ſmall ſtone, and have ſince that period been ſubject to violent attacks of ſtrangury.

1738.

Oct. 17. I began Mrs. Stephens's medicines.

18. The urine ſmelt ſtrong, and my pains were increaſed, which were almoſt continual. I paſſed one oblong angular bit of ſtone that day.

19. The urine full of white ſediment, and continues ſo. Frequent ſtoppage. Great pain.

20. Frequent ſtoppage. Paſſed 1 angular broad flake of ſtone.

21. Leſs pain. Paſſed 3 flakes of ſtone.

22. Leſs pain. Paſſed many angular bits, but ſmall. Extreme pain for half an hour.

23. Paſſed more than 12 white flakes of ſtone, and above 20 ſmall angular bits. In my microſcope, the flakes appear very diſtinctly like pieces of rotten rock rent aſunder.

Oct. 24. Paſſed as many flakes to-day as yeſterday. Some of them white on one ſide, and a little reddiſh on the other.

Obſervations. I apprehend the white ſide is that expoſed to the medicated urine, and the other ſide is that which is broke off from the main ſtone, whoſe colour it may be ſuppoſed to have.

Since I have taken Mrs. Stephens's medicine my urine is become alkaline, that is, it turns ſyrup of violets green, and ferments with acid liquors. This I thought very remarkable when I firſt obſerved it, and began to hope, that urine, which was ſo different from common urine, might have different effects upon ſtones in the kidneys and bladder. And I have lately been informed, that even common urine, when it putrefies, that is, turns alkaline by being kept, will diſſolve and take up the calculous incruſtations upon the ſides and bottoms of the urinals. I boiled different pieces of ſtones, which were taken from the human bladder, in my own alkaline urine, and common urine. The firſt were waſted conſiderably, and their ſurface turned white and ſoft: —but thoſe in common urine had little effect produced on them.

I ſhall continue to ſend you an abſtract of my diary, which I keep very exactly. I conſtantly confine myſelf to my chamber, that by a ſtate of reſt the medicated urine may lie longer upon the ſtone. I believe you will think this account as encouraging as could be expected in nine days. I confeſs the event has much exceeded my expectations. Such as it is I have ſent it, that I might do juſtice to Mrs. Stephens, and alſo to the public. I long much to know the ſtate of the ſubſcription, and whether you be able to make any probable calculation when it will be completed, that the public may have the knowledge of this glorious diſcovery *.

Oct. 25. Paſſed 37 *flakes* of ſtone, 3 thicker than uſual, and one of them much larger than any of the former. Much white ſediment, many angular bits.

26. Paſſed 68 *flakes* of ſtone, many of them equal to the largeſt of the former.

27. Paſſed 64 *flakes*.

28. Paſſed 90 *flakes*.

29. Paſſed 38 *flakes*, 2 of them a quarter of an inch broad.

30. Paſſed 34 *flakes*.

31. Paſſed 56 *flakes*.

Nov. 1. Paſſed 29 *flakes*.

Obſervation. All I have paſſed are convex and white on one ſide, concave and brown on the other.

2. Paſſed 6 *flakes*.

3. No flakes or bits.

4.
5. } No flakes.
6.

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* Vide note * p. 567.

Obſervation. There appears a kind of ſtop in the operation of the medicine, though my mode of living is the ſame, and I take my medicine regularly.

Perhaps the outward coat of the ſtone is come away, and the internal coat is much *harder*, and requires more time in being diſſolved and broken down.

I have had throughout *great pain* in paſſing my water, but eſpecially theſe laſt four days. Having gathered a large tea ſpoonful of the *white ſediment*, and drained off the urine from it as well as I could, I left it three days in the open air, and found the urine evaporated, and the ſediment grown into *a ſolid calculous maſs*, which I broke into pieces. Theſe had the ſame appearance in my microſcope as *the flakes of ſtone* which I had paſſed. I think this ſeems to prove that *the white ſediment* is really a part of the ſtone, reſolved into an impalpable powder.

Nov. 7. Paſſed 1 *flake*, and 1 *angular bit.*
8. Paſſed 1 *flake.*
9. Paſſed 2 *bits* of the ſame ſubſtance with the *flakes*, but ſofter.
10. Paſſed 2 *flakes*, pretty large, one of them having the ſurface of a ſphere, or like the top of a braſs nail, with a convexity and concavity; alſo 1 *bit* of ſtone,

ſtone, of a dirty colour, with *veins of white.*

11.
12. Paſſed no flakes, but *divers angular bits*;
13. with much *white ſediment*;—pellucid
14. mucus, and very great pain.
15.

My pains have been great throughout, but *moſt* when *this mucus* paſſes from me. Sometimes I imagine this mucus is no more than *the mucus* ſecreted from the glands of the bladder and urethra, contrived by provident nature to ſheath the acrimonious ſalts of the urine, that they might not offend the tender parts through which they paſs; and that the alkaline medicated urine is ſo *very deterſive* as to wear off and ſcour away this mucus, leaving the bladder and adjoining parts exceeding bare, and conſequently obnoxious to pains raiſed by the ſtony particles, angular bits, and coarſer parts of the ſediment while paſſing *.

Beſides the diſagreeable taſte of Mrs. Stephens's ſolvent, and its frequently nauſeating the ſtomach, its cauſtic and irritating effects on the animal ſyſtem, and the urinary paſſages in particular, were great diſcouragements to its liberal uſe.

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* We will break off the relation of this caſe here, not to tire our readers with a repetition of the ſame ſtory, obſerving, at the ſame time, that Mrs. Stephens's medicines, when once begun cannot be left off, however ſtrong the indications to deſiſt from their uſe; for the ſtone, having become *corroded* and *ſoftened* by the medicated urine, ceaſes to irritate the bladder; but if the medicines are left off, it ſoon returns to a ſtate of hardneſs, and the rugged ſurface occaſions then the moſt lancinating pains.

Mrs. Stephens's *medicines*, notwithſtanding the great relief they had afforded to many, were therefore ſoon laid aſide. They were, however, laid aſide *with regret*, ſince this inference ſeemed to be warranted by the whole ſum of facts, that *much benefit* might be derived from them, provided their collateral bad effects could be obviated. Could *theſe inconveniences* be removed by any combination, that would ſtill leave *the alkaline ſalt* at liberty to unite with *the acid*, which is ſuppoſed to contribute to the formation of theſe calculi, the purpoſe of *preventing their being generated*, or *of diſſolving them when formed*, would probably be in a good meaſure anſwered. It was reſerved for a reſpectable member of the medical profeſſion, ſtill living *, to engage the modern chemiſtry in the ſervice of medicine, and realize a project, which now ſeemed to be relinquiſhed in deſpair. This gentleman's reflections were quickened by his own feelings, and in 1778, after having been for *eighteen* years ſubject to ſevere paroxyſms, began to take a ſolution of fixed vegetable alkali, ſuperſaturated with carbonic acid *(charcoal* and *oxygen)*. This gentleman thought that by this means *the alkaline ſalt* would be rendered leſs diſagreeable, and at the ſame time milder, without loſing its well known *lithontriptic quality*; for, as Mr. Scheele and Sir Torbern Bergman had proved, that the human calculi in the bladder were made up of *an acid* and *an earth*, *a double elective attraction* might poſſibly take place,—the acid *of the calculus* having a ſtronger attraction for the alkaline baſis of *this neutral ſalt*, would unite with *the alkali* of the neutral ſalt,—while the carbonic acid, being diſengaged from *the neutral ſalt*, might, in its turn, unite alſo with the earth of the calculus.—He found alſo, that by infuſing pieces of calculi in the urine of ſuch perſons as were taking the aqua mephitica alkalina, it exhibits a conſiderable *lithontriptic quality*, and having put a fragment of a calculus, weighing 51 grains, into the alkaline neutralized ſolution, at the end of 31 days it was found to have *loſt* 36 grains of its original weight. This medicine very ſoon relieved his ſymptoms, and, as it will appear from the account of his caſe, has kept him *free from pain* for *ten years*, one ſlight attack excepted, which is aſcribed to *the diſcontinuance of the medicine for ſeveral weeks*. As this caſe is extremely intereſting we will give it.

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* Benjamin Colborne, Eſq.

BENJAMIN COLBORNE's CASE.

Mr. Colborne, apothecary, of the city of Bath, in the year 1760, was attacked with a violent nephritic paroxyſm, which, after continuing ſeven or eight days, and being treated with anodyne, oily, and mucilaginous medicines, and bleeding, terminated in the diſcharge, by urine, of a red ſtone larger than a vetch or tare, after which he continued tolerably well for eight or ten months; often, however, obſerving ſmall calculous concretions to come away, attended with irritation of the urinary paſſages.

In about ten months after the firſt attack, he had another, but neither ſo violent or of ſo long duration, which terminated like the firſt, in the diſcharge of a ſtone of a ſimilar colour to the foregoing, but of a ſmaller ſize.

The nephritic paroxyſm again returned in about five or ſix months, but not ſo violent as at firſt. During this time he was in a courſe of taking mucilaginous and lubricating remedies.

After this he made trial of Mrs. Stephens's remedy, as prepared by Dr. D'Eſchernay, of which he took about an ounce in a day, once or twice a week.

After this, *he continued free of nephritic complaints about a year and half.* That medicine, however, agreed ſo ill with his ſtomach, *producing nauſea, indigeſtion, and crudities, that he was obliged to leave it off.*

About three or four months afterwards he had another attack, which returned upon him every ten or twelve weeks.

In the year 1766, he made a trial of Blackrie's Lixivium (or Chittick's remedy), and thought it agreed with him rather better than ſoap; yet it was ſo cauſtic and irritating to the mouth and throat, and produced ſuch painful ſenſations in his ſtomach, *that he was obliged to leave it off*; after which his nephritic paroxyſm returned every eight or ten weeks as before.

On March 27, 1778, he had an attack of the gout, which continued on him until the 14th of April, when he was taken with a violent vomiting, attended with pain in the left kidney. By the help of the warm bath and bleeding, he paſſed another calculus. After this he had a ſecond attack of the gout, which continued a few days.

As ſoon as it was over he began the uſe of the *alkaline medicine* with *fixed air*, as above deſcribed. *During the uſe of this he parted with no gravel, his urine depoſited no ſediment whatſoever, or diſcoloured the veſſel, though if it was omitted even for a few days theſe appearances took place, and ſmall bits of gravel were perceived in his water.*

From this time he continued in perfect health, and *free of all nephritic complaints*, until the 26th of Auguſt 1783, when, about three in the morning, he was taken with an irritation in the urinary paſſages, which prevented his ſleep, his urine however was not high coloured; about ſeven in the morning he had two purging ſtools; he had but little pain in the kidney, but a heavy obtuſe ſenſation over the os pubis, which continued with ſome ſickneſs till about two o'clock, when the ſtone ſeemed to enter the bladder. From that time he became perfectly eaſy.

In order to diſcharge the ſtone from the bladder, he drank large quantities of mucilaginous liquors, and retained his urine as long as poſſible. About ſix in the evening *he diſcharged a red calculus*, ſmaller than what he had before done.

It is proper to obſerve, *that he had been at* Harrowgate *about four or five weeks before this happened*, and drank the Harrowgate water, which, as it acted not only as a purgative, but as a diuretic alſo, he was induced to think he might *ſafely omit* the alkaline ſolution. It appeared however, to his great diſappointment, that the calculus was generated *during that interval.* From that time to the preſent he has never, for *two days ſucceſſively*, omitted taking the ſaturated alkaline ſolution, and *has never ſince felt the ſmalleſt uneaſineſs; no grains of ſand or other precipitation in the urine, nor any diſcoloration of the veſſel, except when the medicine is omitted for a day.* But, upon taking the ſolution again, the urine made afterwards *diſſolves the former diſcoloration*, and ſtill continues perfectly *clear.* During the time he was ſubject to nephritic paroxyſms, his urine was ſubject to putrefy very ſoon, but ſince he has taken the ſolution it will keep three or four days in the warmeſt weather without ſhewing any ſigns of that diſpoſition. His health, ſtrength, and ſpirits, are all perfectly good; and, as he thinks, better than they were twenty years ago *.

Experience

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* It is to Benjamin Colborne that Dr. Beddoes dedicates his Obſervations on the Nature of Calculus, &c. His words are, " Sir, It has been frequently with great confidence affirmed, that our acute pains are of ſhort duration. A very ſlight acquaintance, however, with the tremendous catalogue of human maladies, will ſatisfy us that this is the vain aphoriſm of a ſophiſt, more anxious to place words in oppoſition, than to obſerve the courſe of nature. Our excruciating diſeaſes are, if I do not compute very much amiſs, remarkable for length of paroxyſms, and for frequency of recurrence; while in thoſe of a different character, languor and depreſſion are ſcarce leſs intolerable than the moſt intenſe pain.

" I hope, and I believe, that this mighty maſs of evil will be gradually diminiſhed, and finally diſappear from the face of the earth. We are juſt beginning to catch a glimpſe of the laws of animal nature; and now, when the human mind ſeems, in ſo many countries, about to be rouſed from that torpor, by which it has been ſo long benumbed, we may reaſonably indulge the expectation of a rapid progreſs in this, the moſt beneficial of all the ſciences.

" Much as you have contributed, by the frank and diſintereſted communication of your diſcovery, to obliterate one of the darkeſt ſhades from the proſpect of life, your name is, I ſuſpect, ſcarce known beyond the narrow circle of the practitioners of medicine, except, perhaps, to a few among thoſe who are indebted to you for eaſe and health. Such is the

Experience has ſince amply confirmed the virtues of a medicine, which, I apprehend, may be *freely taken without danger*, and even *without inconvenience* (except in a few rare inſtances), and which ſeems to have deſerved the ſingular praiſe of *equalling* the expectations raiſed by the perſon who firſt propoſed it. But when we conſider the high price and brittleneſs of Newt's apparatus, and the care that muſt be uſed in conducting the proceſs, and the neceſſity there is of conſtantly *continuing* the medicine, *a remedy ſeemed ſtill wanting adapted to the condition of the poor, who are by no means exempted from calculous diſorders.*

In the year 1787, a perſon belonging to the medical profeſſion, and much afflicted with the gravel, complained to Dr. Beddoes that he was unable to perſevere in the uſe of the aqua mephitica alkalina, on account of the great dizzineſs it always occaſioned with him. I was led, ſays this benevolent phyſician, from this intimation to reflect upon the ſubject, and after ſome time fell upon a formula, of which I think myſelf fully warranted in aſſerting, that it is *extremely beneficial* in calculous complaints,

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the inattention of mankind to their beſt benefactors! and ſo entirely have fatal illuſions perverted our moral ſentiments! I cannot hope to add much to your reputation; but by attempting to diffuſe more widely the benefit for which mankind are originally indebted to you, I ſhall certainly afford you gratification."

and that it may, *without injury*, be taken in very *large quantities*, and continued for a *great length of time*. Its ſimplicity and its cheapneſs are its *great recommendations*. It is SAL SODA, OR NATRON, *made into the form of pills with ſoap, or any other cement*. *Bark* and *aromatics* may be occaſionally added. The trials that have been already made of *this remedy* ſufficiently prove it to be at the ſame time both *efficacious* and *harmleſs*; and this invention may be truly ranked among the many very *uſeful diſcoveries* that have been made by this excellent and truly philanthropic phyſician.

PRACTICAL OBSERVATIONS.

SECT. XCIII.

THE TREATMENT OF THE GOUT.

When an opinion in reſpect to the origin of any diſeaſe is ſupported by probable circumſtances, and ſtrengthened by coincidence with every practical deduction, much advantage may ariſe from it. There are few diſeaſes in reſpect to the ſources of which the evidence is ſo complete, as we ſhall endeavour to give concerning thoſe under conſideration. Our moſt important concluſions will be drawn from chemical facts, not too refined for being made the ground of juſt inference, but obvious and unambiguous. It has been proved, that in the general fluids of the body, or in particular portions of theſe, there is a peculiar matter of the acid kind, which in its common ſtate is combined with a matter that keeps it ſuſpended, and in a ſtate of ſolution.—This is in many caſes redundant, ſometimes perhaps from too great a portion

tion being produced by the animal operations, but more commonly hurtful from a precipitation of it by a ſtronger acid, which may be one of the native acids, or an acid conveyed from the alimentary canal.—That loſing its combinations with alkali or earth, it appears in the urine as a preternatural ſediment under various ſhapes; and, when the proportion is greater in any ſituation of the body than can be retained in ſolution by the fluids of the part, a concretion of particles takes place ſo as to form, in the urinary paſſages, gravel and calculi—in other places, but eſpecially in tendons and ligaments, from circumſtances in their nature and circulation preinclining to the effect, a depoſite which becomes the cauſe of gout.

To predominating acidity theſe diſeaſes are to be aſcribed—to acidity which ſometimes may have its origin in the veſſels themſelves: it may be the production of the general habit, or perhaps may proceed from the morbid operations of a part—to acidity which more frequently is generated in the ſtomach—and not uncommonly to acidity introduced by the mouth.

That acids are greatly inſtrumental towards the production of gout, is an opinion which was founded upon obſervation, and has long been maintained. The diſeaſe, as well as gravel, has in many caſes been attributed to an exceſſive uſe of acids. It has likewiſe been regarded as intimately connected with that ſtate of the ſtomach, in which there is an almoſt perpetual generation of acids. At the ſame time, however, a variety of circumſtances of a different kind have been enumerated as ſources of it. If we examine with attention the condition of many in whom gout makes its appearance, we ſhall generally find, that thoſe other circumſtances have chiefly been productive of it, when they have had the previous effect of impairing the digeſtive faculties, and cauſing a conſequent tendency to the generation of acid. Of this nature are inſobriety, luxury, indolence, and voluptuouſneſs. The diſeaſe frequently attends upon a habit of drinking, on account of the acids conveyed into the body by means of it. The tendency of different liquors to produce it, is not ſo much in proportion to their ſtrength, as to the quantity of acid in their compoſition. This aſſertion is warranted by the experience of ages; the liquors in which acid predominates having been invariably conſidered, by the beſt authorities, as peculiarly prediſpoſing to gout. Shallow of obſervation muſt be the man, who, accuſtomed to endure the pains of gout, has not become acquainted with the injury of acids. By immoderate indulgence in intoxicating compounds of any kind, by a life of luxury, by a ſtate of indolence, and by an inordinate purſuit of pleaſures, the powers requiſite for the proceſs of digeſtion are at laſt brought into diſorder, and the contents of the ſtomach permitted to run into common fermentation. Theſe and other circumſtances, which tend to vitiate the action of the ſtomach, and conduce, by reaſon of derangement, to the formation of acid, may be looked upon as remote cauſes of gout and of gravel.

Gout is one of the diſeaſes which has the appearance of being tranſmitted by parents to their offſpring. This circumſtance may be advanced as an argument againſt its proceeding from the introduction of acids, but on reflection will be found to give weight to that opinion. In the multitude of affections depending upon peculiarities of habit, there is not one more uniform in its occurrence than that diſpoſition to ſtomach derangement which is the ſource of much diſorder in the ſyſtem. The features of the face, the propenſities of genius, the nature of the paſſions, or the diſpoſition of the mind, have not greater reſemblance in conſanguinity than the condition of the ſtomach. A conſtitutional imperfection in the digeſtive faculties, or that condition of ſtomach in which a part of the food is perpetually running into theſe fermentations which produce acidity, is a great hereditary ſource of gravel and gout.

A defect in the digeſtive proceſs frequently ſucceeds to irregularity, to intemperance, and to unavoidable expoſure, under many ſituations, to circumſtances that are the occaſion of debility and diſeaſe. In a great number of habits, however, there is original and conſtitutional imperfection, which may be marked even in the earlieſt periods of life before any morbid temperament has been contracted, and is found in the advanced ſtages to become greater with increaſe of years.

When an opinion in reſpect to the origin of any diſeaſe is ſupported by probable circumſtances, and ſtrengthened by coincidence with every practical deduction, much advantage may ariſe from it. There are few diſeaſes in reſpect to the ſources of which the evidence is ſo complete, as we have endeavoured to ſupply concerning theſe under conſideration. Our moſt important concluſions are drawn from chemical facts, not too refined for being made the ground of juſt inference, but obvious and unambiguous. It has been proved, that in the general fluids of the body, or in particular portions of theſe, there is a peculiar matter of the acid ſpecies, which in its common ſtate is combined with ſomething that keeps it ſuſpended, and in a ſtate of ſolution.—That this matter is in many caſes redundant, ſometimes perhaps from too great a portion being produced by the animal operations, but more commonly from a precipitation of it by a ſtronger acid, which may be one of the native acids, or an acid conveyed from the alimentary canal.—That loſing its combination with alkali or earth, it appears in the urine as a preternatural ſediment under various ſhapes; and, when the proportion is greater in any ſituation of the body than can be retained in ſolution by the fluids of the part, a concretion of particles takes place ſo as to form, in the urinary paſſages, gravel and calculi—in other places, but eſpecially in tendons and ligaments, from circumſtances in their nature and circulation pre-inclining to the effect, a depoſite which becomes the cauſe of gout.

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Boſc D'Antic, in his *Memoire ſur les differens Etats de l'Acide dans l'Economie Animale,* conceives the acid of the ſtomach to be phoſphoric, and goes the length of aſſerting that it does not form with alkalis the compounds that would reſult from their union with vegetable acid. "*Il n'eſt pas rare que les hypochondriaques, les femmes hyſtériques, les femmes ancientes éprouvent des aîgreurs dans l'eſtomac et dans l'œſophage, et rendent meme par le bouche une liqueur tres-acide. Un léger purgatif, en emportant la ſurabundance de cet acide, les délivre, du moins pour quelque temps, de cette incommodité. Cet acide ne faiſant pas efferveſcence avec les alkalis aérés, et ne formant avec l'alkali* *l'alkali fixe du tartre, ni de la terre foliéc, ni du tartre tartariſé, ne ſauroit être regardé comme un acide vêgétale."*

The prevention of acidity from fermentation in the ſtomach is to be effected by regard to diet, by avoiding every circumſtance that might contribute to diſorder, and by increaſing the proper faculties of digeſtion. To a ſtomach in the right exerciſe of its powers, cautious ſelection of diet is not neceſſary; the aſſimilating proceſs extends equally over the matter of animals and vegetables, to the production of fluids for the nouriſhment of the body. A diet purely vegetable would not give occaſion to preponderating acid, nor would inconvenience be endured from the putreſcent bias of an animal regimen; but we before remarked, that an imperfection in the digeſtive functions is an original error of many habits, which are frequently in other reſpects of great apparent ſtrength. A great proportion of the people in this country, and perhaps over the globe, are conſtitutionally deficient in the aſſimilating proceſs. Digeſtion, which when complete does not admit of common fermentation in the firſt paſſages, is but half performed, and acidity or putrefaction, with their extended train of evils, are perpetually taking place. To ſtomachs of this deſcription—and ſuch are the ſtomachs which may be termed the hot-beds of gravel, of gout, and of biliary affections, the greateſt circumſpection is neceſſary in reſpect to the quality and quantity of every thing received *.

A variety of medicines may be employed for promoting the action of the ſtomach. Bitters have long been diſtinguiſhed for this effect: chalybeates are of great avail. Aromatics, the medicines termed anti-ſpaſmodic, and warm reſinous ſubſtances, may be turned to good account. The greateſt caution, however, is neceſſary in the uſe of ſuch articles—they are active engines, by means of which much good or evil may be achieved: they ſhould never be employed at random, but ought in all caſes to be under judicious regulation and management, by which their operation may be pointed to a ſecure and ſalutary iſſue. They are powerful in correcting a diſpoſition to acidity; but in reſpect to theſe and ſimilar medicines it may be obſerved, that they are only to be occaſionally called to the aſſiſtance of the ſtomach. The greateſt misfortunes have ariſen from their long continued uſe. There cannot be a practice more pernicious, than the conſtant employment of any medicine which maintains artificial exertion, until the habit of natural action is loſt, and in the end the powers are exhauſted.

We are inclined, then, to reprobate the practice of daily taking tanſey tea, tincture of bark, and

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* For many judicious remarks relative to the diet proper for gouty ſubjects, we refer the reader to the life of Dr. Brown, Vol. I. Page 148.

rhubarb, with other bitters. For a means of cure which has ſometimes been purſued, not ſo much by obviating the cauſe, as by counteracting its operation upon the ſyſtem, is attended with infinite danger. By large doſes of bitters and aſtringents, the fits were prevented from taking place, but the functions of the ſyſtem became impaired; accumulation, the natural error of gouty habits, increaſed to the production of univerſal diſorder, or deſtructive plethora; and the œconomy was precluded from the general relief which a paroxyſm of gout would have enſured. It is not ſtrange, that in ſuch caſes fatal affections of the brain and of the viſcera ſhould have occurred, or that indolent rigidity, unſuſceptibility of impreſſion, and muſcular inaction, ſhould have produced a miſerable condition of helpleſs infirmity, even if dropſical diſeaſes have not before cloſed the unhappy life of the ſufferer *.

Salt of ſteel decompoſed by an alkali, with a predominating proportion of the latter, and aided by the active reſin of myrrh, is a remedy at preſent in juſt repute, on account of its peculiar efficacy in caſes where ſtomach and biliary affection is ſeldom abſent, and where prevailing acidity is, in common, at leaſt a concomitant ſymptom †.

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* Vide the effects produced by the Portland Powder, Sect. XXIV. Page 107. Vol. IV.

† For the formula, vide Vol. III. Page 618, at the bottom.

We come now to alkalies. Cullen, ſpeaking of them, ſays, "Another remedy which has had the appearance of preventing the gout, is an alkali in various forms, ſuch as the fixed alkali both mild and cauſtic, lime-water, ſoap, and abſorbent earths. Since it became common to exhibit theſe medicines in nephritic and calculous caſes, it has often happened that they were given to thoſe who were at the ſame time ſubject to the gout; and it has been obſerved, under the uſe of theſe medicines, gouty perſons have been *longer free* from the fits of their diſeaſe. That, however, the uſe of theſe medicines has entirely prevented the returns of gout, I do not know; becauſe I never puſhed the uſe of thoſe medicines for a long time, being apprehenſive that the long continued uſe of them might produce a hurtful change in the ſtate of the fluids."

"Some remarkable caſes, however, have lately occurred in this city of the efficacy of aerated alkaline water, in preventing the returns of the paroxyſms of the gout. It requires to be taken for a great length of time, to inſure ſucceſs; but the patient is encouraged to perſevere in its uſe, in conſequence of a ſpeedy removal of ſome of the moſt troubleſome ſymptoms."

The method of making it is deſcribed by ſeveral authors; but, for the ſake of thoſe readers who are unacquainted with the proceſs, I ſhall give an abſtract of it.

Diſſolve three ounces, Troy weight, of good ſalt of Tartar in a gallon and a half of rain water, or good ſoft ſpring water; filter the ſolution, and put as much of it into the middle glaſs of Nooth's machine as will completely fill the veſſel, reſerving the remainder for a ſubſequent making. The effervеſcing materials muſt then be put into the lower veſſel, and a gentle ſtream of fixed air muſt be made to paſs through the liquor, till it taſtes evidently acidulous, which will probably require forty-eight or ſixty hours, or in ſummer more.

The method of managing the effervеſcence is of conſiderable conſequence; for, if it is too violent at firſt, much air eſcapes through the veſſels without effect. Aſcertain, by previous experiment, how much of the vitriolic acid, which you have procured, for it is of very different ſtrengths in the ſhops, will ſaturate a drachm of the chalk. Put four ounces of dry powdered chalk into the lower veſſel, and ſhake it to one ſide; under that ſide put a wedge, ſo as to raiſe it about an inch and an half from the table. With a long funnel, which reaches to the bottom of the veſſel, pour in the quantity of vitriolic acid neceſſary for the ſaturation, which will run down to the other ſide of the veſſel, and not come into contact with the chalk: through the ſame funnel, pour very ſlowly as much water as will be ſufficient to cover about a fourth part of the chalk as it then lies. The veſſel being gently ſhaken occaſionally, the effervescence will go on very ſlowly, and the alkaline liquor will be ſooner and more effectually ſaturated, than if the effervescence had been too violent. If the materials are not ſufficient for giving an acidulous taſte to the liquor, the lower veſſel muſt be waſhed, and freſh chalk and acid again put into it.

The doſe of this water is half a pint about noon, and another in the evening. In urgent caſes half a pint has been given morning, noon, and night, for a conſiderable time together, without diſagreeing with the ſtomach, or injuring the appetite or general health of the patient. If it prove flatulent, a tea-ſpoonful or two, but not more, of ſpirituous cinnamon water may be taken in each doſe. If it inflame, or too violently irritate the urinary paſſages, five or ten, or in urgent caſes, twenty drops of laudanum may be taken with each doſe of the water, or it may be given in milk *.

Where the expence of the aerated alkaline water is more than can be conveniently ſupported, *Lime water* may be employed as a ſubſtitute.

Lime-water enters the veſſels by abſorption, and carries its effects over the ſyſtem. By ſuch additions as are often made to the lime-waters, it may be rendered not an ungrateful liquid, and might, in ſome caſes, be ſubſtituted for every other fluid. Tea made with lime-water might ſoon, perhaps, be thought more offenſive in colour than in taſte. In a work of juſt celebrity and eſteem, Dr. Blane's valuable Treatiſe upon the Diſeaſes of Seamen, lime is recommended for preventing the contamination of water, and lime-water employed for culinary purpoſes, is regarded not merely as devoid of prejudice towards the ſyſtem, but conducive to the prevention of dangerous bowel affections: it ſtands acquitted of pernicious effects, upon an authority of nice obſervation and accurate diſcernment. With ſuperior advantage it may be admitted where the morbid inclination of the habit is to redundant acidity.

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* The mephitic alkaline water is beſt prepared by Swepps, Margaret Street, Cavendiſh Square.

Volatile alkali, which excites the operation of the ſtomach, and is an agreeable ſtimulant to the ſyſtem, may be made very beneficial in caſes of languor and inaction. It rouſes to requiſite exertion the exterior arrangement of an indolent habit. This, and alkaline medicines of every kind, may be occaſionally combined with purgatives, with bitters, with reſins, with aromatics, with chalybeates, or with any remedy that may appear ſuited to the individual. For it is not our deſign to enter minutely into the methods of carrying theſe intentions into effect, but merely to touch upon general principles, of which the proper application to individual caſes muſt be accommodated to multiplied varieties of conſtitutional temperament, cuſtomary habit, and particular conveniency, which can alone be learnt by experience.

PRACTICAL OBSERVATIONS.

SECT. XCIV.

GALL-STONES.

The calculi formed in the liver and gall-bladder differ entirely from thoſe of the urinary paſſages, and appear to conſiſt principally of the reſin of the bile. They are moſt commonly ſoluble in alkalis. They melt in the fire, and are inflammable. In general properties they agree with the matter that is precipitated from bile by acids: a queſtion then ariſes, whether or not the ſeparation even in the body may not be effected by an acid? It is certain that habits, in which they commonly occur, are thoſe in which acid is redundant. The formation of gall-ſtones is generally accompanied with great derangement in the functions of the ſtomach. The ſymptoms, which paſs under the denomination of bilious, and proceed from vitiated digeſtion, are ſeldom wanting.

Cloſe obſervance of the circumſtances under which they are generated, affords the ſtrongeſt preſumption of the influence of acids, received into the ſtomach, or formed in the body by a morbid proceſs of fermentation, in producing them. It may be aſſerted, without much riſque of contradiction, that gall ſtones are ſeldom preſent when acidity in the firſt paſſages has not abounded. This being the caſe, and the alteration correſponding exactly with the effects of acids upon the bile, we are induced to ſuppoſe that the acid of the ſtomach is conveyed to the liver.

When biliary calculi are ſaid to conſiſt of the reſinous part of the bile, it is not to be inferred that they are in every inſtance the reſin pure and entire. In many caſes there may be a mixture of animal mucilage, or of any other matter that may be blended with the bile when the condition of the liver is diſordered. Sometimes lithiſiac acid may form a part. In ſchirroſities of the liver, the obſtructing matter that pervades the ſubſtance of that gland, looks frequently like the reſin of the bile in conjunction with that kind of glutinous ſubſtance which is yielded by glands under ſcrophulous affection. The baſis however of gall-ſtones is that matter which appears in a ſolid conſiſtence when acids are mixed with the bile. It is a requiſite of which they are ſometimes entirely compoſed, and without a portion of which they are never formed.

The ſource of this affection with that of gout is nearly the ſame; the means of prevention will be the ſame; and muſt principally conſiſt in guarding againſt acidity, and counteracting or diminiſhing the operation of acids.

As the gall-ſtone in its paſſage produces a painful ſpaſm of the gall duct, opiates have been freely given, the warm bath preſcribed, and bladders of warm water placed over the pit of the ſtomach. Glyſters have been often ordered, but caſtor oil produces a more beneficial effect.

PRACTICAL OBSERVATIONS.

SECT. XCV.

CURE OF THE RHEUMATISM.

Having given it as my opinion, that gout and rheumatiſm have the ſame proximate cauſe, I now proceed to the cure, which in ſome meaſure applies to both diſeaſes.

Whatever difficulty may occur with reſpect to the explanation given above, this remains certain, that in acute rheumatiſm, at leaſt in all thoſe caſes which do not ariſe from direct ſtimuli, there is an inflammatory affection of the parts, and a phlogiſtic diatheſis in the whole ſyſtem; and upon theſe is founded the method of cure, which frequent experience has approved of.

The cure thereof requires, in the firſt place, an antiphlogiſtic regimen, and particularly a total abſtinence from animal food, and from all fermented or ſpirituous liquors; ſubſtituting a vegetable or milk diet, and the plentiful uſe of bland diluent drinks.

Upon the ſame principle, at leaſt with perhaps the ſame exception as above, blood-letting is the chief remedy of acute rheumatiſm.

To avoid that debility of the ſyſtem, which general bleedings are ready to occaſion, the urgent ſymptom of pain may be often relieved by topical bleedings; and, eſpecially when any ſwelling and redneſs have come upon a joint, the pain of it may be very certainly relieved by ſuch bleedings *.

In the acute rheumatiſm applications to the pained parts are of little ſervice. Fomentations, in the beginning of the diſeaſe, rather aggravate than relieve the pains. The rubefacients and camphire are more effectual in relieving the pains; but generally they only ſhift the pain from one part into another, and do little towards the cure of the general affection. Bliſtering, applied to the pained part, many alſo be very effectual in removing the pain from it; but will be of little uſe, except where the pains are much confined to one part.

It will be neceſſary to keep the body ſoluble. Aloetics, rhubarb, magneſia alba, or flowers of ſulphur, may be employed, as the one or the

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* Theſe are beſt performed by leeches, four or five of which ought to be applied at once over the inflamed part.

other may happen to be beſt ſuited to particular perſons *.

The

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* The following formulæ may be uſed in particular caſes:

℞ Aloes Socotorin. dr. 2.
Gum. guaiac. dr. 3.
Tinct. Rhei cum Aloe, q. s.
M. f. maſſa, in pilulas equales lxxv. dividenda; quarum ſumat iii. vel iv. pro re nata.

That is, take of
Socotrine aloes—two drachms.
Gum guaiacum—three drachms.
Tincture of rhubarb with aloes—as much as is ſufficient.
Make into ſeventy-five pills, of which three or four are to be taken at bed time, occaſionally.

℞ Pulv. Rad. Rhei, dr. 3.
Magneſ. alb. dr. 4.
Gum. guaiac. dr. 2.
Confect. aromat. dr. 2.
Syrup. comm. q. s.
M. f. Elect. cujus ſumat magnitudinem juglandis mane et veſpere, vel pro re nata.

That is, take of
Powdered rhubarb—three drachms.
Magneſia—four drachms.
Gum guaiacum—two drachms.
Aromatic confection—two drachms.
Simple ſyrup—as much as is ſufficient.
To be made into an electuary, of which the ſize of an acorn is to be taken night and morning, as occaſion may require.

This

The ſeveral remedies mentioned above moderate the violence of the diſeaſe, and ſometimes remove it entirely; but they ſometimes fail in this, and leave the cure imperfect. The attempting a cure by large and repeated bleedings is attended with many inconveniences, and the moſt effectual and ſafe method of curing this diſeaſe, is, after ſome topical bleedings for taking off, or at leaſt diminiſhing, the phlogiſtic diatheſis, to employ ſweating, conducted by the rules before laid down *.

Opiates,

This laſt medicine has been extremely beneficial in removing coſtiveneſs, and in giving a tone to the ſtomach.

An ounce, or an ounce and a half, or two ounces of the Vinum Aloes of the London Pharmacopœia, is alſo a good purge for gouty perſons.

The Tinctura Sennæ of the Edinburgh Pharmacopœia, is likewiſe a good medicine where we cannot uſe aloetic purges, as in caſes of piles. In theſe caſes alſo we may uſe ſulphur; of which the following form is very convenient:

℞ Flor. ſulphuris, unc. 2.
Elect. e ſen. unc. 2.
Pulv. rad. jalap. dr. 2.
——— Zinzib. dr. 2.
Syr. ſimpl. q. s.
M. f. Elect. cujus ſumat quantitatem juglandis pro re nata.

* Sweating is moſt effectual in this diſeaſe, when produced by Dover's powder, or as it is called in our Pharmacopœias, Pulvis Ipecacuanhæ compoſitus. The doſe of it is twelve or

fifteen

Opiates, except where they are directed to procure ſweat, always prove hurtful in every ſtage of this diſeaſe *.

The Peruvian bark has been ſuppoſed a remedy in ſome caſes of this diſeaſe; but we have ſeldom found it uſeful, and in ſome caſes, hurtful. It appears to me to be fit in thoſe caſes only, in which the phlogiſtic diatheſis is already much abated, and

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fifteen grains, repeated at intervals, of two or three hours, till a ſweat be produced. Diluent drinks are to be uſed with it; and it may be neceſſary to obſerve, that they ought to be ſuch as are bland, and by no means ſtimulating; viz. barley water, linſeed tea, thin water gruel, &c.

* Notwithſtanding this caution, many practitioners uſe opiates, eſpecially when joined with camphor, to procure ſweats in acute rheumatiſm. This compound never fails to increaſe the phlogiſtic diatheſis, and conſequently muſt be hurtful. In the chronic rheumatiſm, indeed, camphor and opium together form a valuable medicine. The doſe is the following bolus:

℞ Camphor. gr. vi.
Sp. vini, gutt. x.
Opii, gr. i.
Kali vitriol. gr. xv.
Syr. q. s. M. f. bolus.

That is, take of

Camphor—ſix grains.
Spirits of wine—ten drops.
Opium—a grain.
Vitriolated kali—fifteen grains.
Syrup—as much as is ſufficient for a bolus.

where, at the ſame time, the exacerbations of the diſeaſe are manifeſtly periodical, with conſiderable remiſſions interpoſed.

Calomel, and ſome other preparations of mercury, have been recommended in the acute rheumatiſm; but I believe they are uſeful only in caſes of the chronic kind, or at leaſt in caſes approaching to the nature of theſe.

Having now treated fully of the cure of the acute rheumatiſm, I proceed to treat of the cure of the chronic, which is ſo frequent a ſequel of the former.

The phenomena of the purely chronic rheumatiſm, mentioned before, lead me to conclude, that its diſpoſing cauſe is an atony, both of the blood veſſels and of the muſcular fibres of the part affected, together with a degree of rigidity and contraction in the latter, ſuch as frequently attends them in a ſtate of atony.

Upon this view of the diſpoſing cauſe, the general indication of cure muſt be, to reſtore the activity and vigour of the vital principle in the part; and the remedies for this diſeaſe, which experience has approved of, are chiefly ſuch as are manifeſtly ſuited to the indication propoſed.

Theſe remedies are either external or internal.

The external are, the ſupporting the heat of the part, by keeping it conſtantly covered with flannel; the increaſing the heat of the part by external heat, applied either in a dry or a humid form; the diligent uſe of the fleſh-bruſh, or other means of friction; the application of electricity in ſparks or ſhocks; the application of cold water by affuſion or immerſion; the application of eſſential oils of the moſt warm and penetrating kind; the application of ſalt brine; and, laſtly, the employment of exerciſe, either of the part itſelf ſo far as it can eaſily bear it, or of the whole body by riding or other mode of geſtation.

The internal remedies are, 1. Large doſes of eſſential oil drawn from reſinous ſubſtances, ſuch as turpentine *; 2. Subſtances containing ſuch oils, as guaicum †; 3. Volatile alkaline ſalts; 4. Theſe, [illegible] or

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[*] Turpentine is an extremely heating oil, as indeed are all the eſſential oils: its uſe therefore requires the greateſt caution. The doſe is from eight to fifteen drops on a piece of ſugar. Venice turpentine may be more conveniently given in the form of an emulſion, by diſſolving it in water by means of yolks of eggs. Two ſcruples of turpentine is the ordinary doſe; and when given in this liquid and diluted ſtate, is much preferable to the oil.

[†] The officinal preparations of guaiacum, are an extract of the wood, a ſolution of the gum in rectified ſpirit, and another in volatile alkali. The gum may be given in the quantity of fifteen or twenty grains for a doſe, either in a bolus, or made into an emulſion with yolk of egg and an ounce or two of water: in larger quantities it is too purgative. The Tinct. guaiac. ammonat. of the Edinburgh Pharmacopœia is an excellent form, as the volatile ſpirit promotes

or other medicines directed to procure ſweat, and laſtly, Calomel, or other preparation of mercury, in ſmall doſes, continued for ſome time, or ſublimated mercury.

These

the medicinal virtue of the guaiacum. The doſe of it is from a drachm to half an ounce, morning and evening, in any convenient vehicle; a tea-cupful of milk is the beſt, as it ſheathes in ſome meaſure the purgency of the medicine.

The following are excellent formulæ.

℞ Guaiac. gum reſ. gr. 15.
Syr. zingib. q. ſ. F. bolus horâ ſomni ſumend.

That is, take of
Guaiacum, the gum reſin—fifteen grains.
Syrup of ginger—as much as is ſufficient for a bolus, to be taken at bed time.

℞ Guaiac. pulv.
Sapon. *aa* dr. 1.
F. pil. 24 cap. pil. 4 bis die.

That is, take of
Guaiacum in powder, ſoap, equal parts a drachm.
Make twenty-four pills, four pills are to be taken twice a day.

R Guaiac. gum. reſ. ſcr. 1.
Sal. cornu cervi. gr. 4.
Conſ. roſ. q. ſ. F. bolus horâ ſomni ſumend.

That

Theſe are the remedies ſucceſsfully employed in the purely chronic rheumatiſm; and there are ſtill others recommended.

The diet in the cure of chronic rheumatiſm ought to be generous and full. In many caſes, eſpecially among people in poor circumſtances, good living, with two or three glaſſes of ſherry in the day, has cured the diſeaſe without any medicines. One material circumſtance ought not to be omitted, viz. that the cure is much impeded by coſtiveneſs: if, therefore, the guaiacum does not procure two motions in the day, it will be neceſſary to give along with it ſome warm laxative. The vinum aloes of the London Pharmacopœia, is a proper medicine

That is, take of

Guaiacum—a ſcruple.
Salt of hartſhorn—four grains.
Conſerve of roſes—as much as is ſufficient for a bolus, to be taken at bed time.

R Guaiac. gum reſin.
Confect. aromatic. *aa* gr. 15.
Terantur ſimul, et ſyrupo aliquo fiat bolus, omni nocte capiendus.

That is, take of

Gum guaiacum.
Aromatic confection—of each fifteen grains.
Let them be rubbed together, and made into a bolus with any ſyrup, to be taken at bed time.

medicine in theſe caſes: its doſe is from one to two ounces: as is alſo the Tinct. Rhei cum Aloe of the Pharmacopœia of the Edinburgh College: its doſe may be from a drachm to half an ounce, as occaſion may require.

END OF THE SECOND VOLUME.

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